Bank of England

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Staff Working Paper No. 998
October 2022

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Abstract

We document that UK government bond yields systematically rise in a two-day window before Monetary Policy Committee (MPC) meetings, which we refer to as pre-MPC windows. The effect concentrates on pre-MPC windows that coincide with new issuance of government bonds. Decomposing the effect into an expected short-rate and a risk premium component, we find that the majority of the yield drift is attributed to increases in risk premia. These effects are present in the US as well. Using UK transaction-level data and analysing trading activity after primary issuances, we find that the dealer sector sells significantly more to the client sector during pre-MPC windows, consistent with dealers' limited risk-bearing capacity. Importantly, we find significant changes in the composition of liquidity providers: hedge funds buy a large share of the issue outside pre-MPC windows, but they shy away from liquidity provision in pre-MPC windows, being replaced by less speculative investors such as foreign government entities and pension funds. We propose a theoretical model to rationalise the change in the composition of liquidity providers before high-informational events, which can also explain the price drift observed in the data.

Key words: monetary policy announcements, price drift, bond supply.

JEL classification: E52, E63, G1, G2.

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The views expressed in this paper are those of the authors, and not necessarily those of the Bank of England or its committees. We would like to thank, for helpful comments and suggestions, Nicola Fusari, Florian Heider, Hibiki Ichiue, Mike Joyce, Peter Karadi, John Lewis, John Power and the participants at the 2nd ECB-BoE-BoJ Joint Research Workshop.

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ISSN 1749-9135 (on-line)

1 Introduction

Two of the most important drivers of long-term nominal interest rates are monetary policy announcements (Gurkaynak, Sack, and Swanson, 2005a,b) and changes in government debt supply (Greenwood and Vayanos, 2014). Given the rising levels of government debt and increased primary issuance activity (often around monetary policy announcements) in recent years, it is natural to presume that monetary policy and bond supply effects could become increasingly intertwined.[1] Yet, how the interaction between these two forces may affect interest rates and bond market liquidity is not well understood. Our paper uses aggregate as well as transaction-level bond market data from the UK to empirically study this interaction and its effect on interest rates. It also presents a theoretical model to illustrate the mechanics of secondary-market trading following bond issuance and prior to an information event such as the revelation of a monetary policy surprise.

We start the empirical analysis by documenting that long-term bond yields systematically rise in a two-day window before Monetary Policy Committee meetings (pre-MPC windows), and we refer to these yield changes as the pre-MPC drift. Over the 1997-2021 period, the cumulative effect of the pre-MPC drift in 20-year bonds amounts to about 2%, which is non-negligible compared to the cumulative changes in realised yields of -6.5% during this period. The effect concentrates on pre-MPC windows that coincide with new issuance of government bonds, and the effect increases substantially during large bond issuances. For example, the average daily change in 10- and 20-year yields during pre-MPC windows is about 0.45-0.51 bps larger than yield changes outside pre-MPC windows. This difference rises above 1 bp when the pre-MPC window coincides a large primary issuance.[2]

Decomposing the pre-MPC drift into a risk premium component and into changes in expectations about future short-term interest rates, we find that the yield drift is primarily driven by increases in risk premia. For example, we show that the majority of the pre-MPC drift in the 10-year yield (0.45 bps) is driven by the risk premium component (0.38 bps), which is strongly statistically significant. The expectations component is small (0.07 bps) and statistically insignificant. We also confirm that the interaction between the debt issuance and the pre-MPC drift manifests entirely in risk premia with its corresponding regression coefficient being highly statistically significant, and that the results are similar when we look at large debt issuances. We interpret these results as stemming from financial intermediaries' balance sheet constraints: the limited risk-bearing capacity of bond market dealers, in the face of a fresh supply of government bonds, may become more strained ahead of days with high aggregate risk such as monetary policy announcements.

Moreover, the price effects of the interaction between monetary policy announcements and

[1]Figure 1 illustrates the increased concurrence of issuance activity and monetary policy announcements.

[2]As explained further below, we call an issuance large when the given issue size is above the median issue size for the corresponding year.

government bond supply are not specific to the UK, and they seem present in other markets such as the US. In a recent paper, Hillenbrand (2020) shows that a narrow window around monetary policy meetings of the Federal Reserve (FOMC windows) captures the secular decline in nominal long-term interest rates over the last three decades.[3] At first sight, this appears to be counter to the findings of our paper. However, we argue that the effect our paper identifies is present in the US as well: we show that all of the yield drift that Hillenbrand (2020) identifies concentrates on FOMC windows that do not coincide with issuance of US treasuries longer than four years maturity. These FOMC windows account for about two third of all FOMC windows in the sample. In the remaining one third of FOMC windows featuring long-term treasury issuance, there is no significant change in yields. Decomposing the FOMC drift into a risk premium component and into changes in expectations about future short-term interest rates, there is some evidence that the risk premium component actually increases during FOMC windows featuring bond issuance (consistent with the UK evidence), and this effect concentrates in the period after the Great Recession when intermediaries in the US treasury market became more constrained (Duffie, 2020; Du, Hebert, and Li, 2022). We interpret these results as suggestive evidence that the learning effect, that Hillenbrand (2020) analyses, is to some extent offset by the liquidity effect, induced by the interaction between monetary policy announcements and changes in government debt supply, which our paper focuses on.

To understand the microstructure-related factors underlining the pre-announcement liquidity effects after bond issuances, we use a transaction-level dataset that covers close to the universe of client-dealer trades in the UK government bond market. Analysing trading activity after primary issuances and around MPC meetings, we obtain two main results. First, the dealer sector, following primary issuances, sells significantly more to the client sector during pre-MPC windows compared to other issuance periods without impending MPC announcements. This is consistent with theories related to dealers' limited risk bearing capacity, as mentioned above, which prompts dealers to off-load the newly issued bonds more rapidly to end users. Second, we find significant changes in the composition of liquidity providers: hedge funds buy a large share of the issue outside pre-MPC windows, but they shy away from liquidity provision in pre-MPC windows, being replaced by less speculative investors such as foreign government entities and pension funds.

Our micro-data analysis confirms that hedge fund trades are more informed (measured by the trades' ability to predict future price movements) on days of monetary policy announcements compared to pre-MPC windows.[4] Consistent with this, we propose a theoretical model to rationalize both the change in the composition of liquidity providers before information events and the pre-MPC drift observed in the data. The model explores the idea that soon-to-be-informed

[3] Hillenbrand (2020) uses a window which includes, in addition to the meeting day, the day before and the day after the meeting.

[4] We also show that the trades conducted by other client types do not exhibit such a pattern. More details are provided in Section 4.3.

clients (such as hedge funds) would refrain from providing dealers with liquidity after the primary issuance as a way to mitigate their price impact.

Our model features two trading days, the pre-MPC day and the MPC announcement day, and three types of agents, dealers, uninformed clients, and an informed client, where the information statuses of clients are relevant only for the second trading day. We model a fully strategic representative informed client where other non-strategic agents impute her demand imperfectly by observing the market price. Naturally, when trading in the MPC announcement day, the informed client faces a price impact per share traded. In turn, not only does the informed client cut down her demand in the MPC announcement day, but she also cuts down her demand in the pre-MPC day in an effort to enter the next trading day with a moderate asset position. That is, the soon-to-be-informed client effectively faces a price impact in the pre-MPC day as well because she trades in a way to mitigate her expected price impact in the next trading day. As a result, our model highlights that clients, who are expected to receive informational signals just before a monetary policy announcement, face a larger marginal cost of liquidity provision because of their increased price impact per share traded.

In view of its main channel highlighted above, our model points to a conflict between liquidity provision to dealers and (anticipated) informed trading. Contrary to what liquidity provision would require, (soon-to-be-)informed clients are less willing to acquire extreme positions before information events. On average, liquidity provision by informed clients fall in these periods, and uninformed clients step in to supply liquidity to the dealer sector. However, these clients are risk averse and demand high risk compensation to buy the newly issued bonds from the dealers especially during times of heightened uncertainty such as pre-MPC windows, generating a price drop in equilibrium.[5]

Related Literature Our paper is related to the recent literature on asset price movements before central bank announcements.[6] The majority of this literature has focused stock markets (Lucca and Moench, 2015; Bernile, Hu, and Tang, 2016; Ai and Bansal, 2018; Neuhierl and Weber, 2018; Cieslak, Morse, and Vissing-Jorgensen, 2019; Laarits, 2020; Ai, Bansal, and Han, 2021; Hu, Pan, Wang, and Zhu, 2022). A small set of papers have looked at how bond prices move around monetary policy announcements (Savor and Wilson, 2013; Brooks, Katz, and Lustig, 2018; Hillenbrand, 2020).

[5]More precisely, dealers and uninformed clients are averse to holding inventory because of their assumed quadratic inventory costs. When risk-neutral informed clients refrain from buying the asset as a result of an impending high-informational event, which also makes holding inventory more costly for dealers and uninformed clients, the price declines below its benchmark value (which would obtain in the absence of an information event).

[6]This is complementary to the literature that focuses on asset price movements after central bank announcements (Cochrane and Piazzesi, 2002; Gertler and Karadi, 2015; Hanson and Stein, 2015; Nakamura and Steinsson, 2018; Albagli, Ceballos, Claro, and Romero, 2019; Hanson, Lucca, and Wright, 2021; Miranda-Agrippino and Ricco, 2021; Kroencke, Schmeling, and Schrimpf, 2021; Pflueger and Rinaldi, 2022; Karnaukh and Vokata, 2022).

Our contribution to this literature is threefold. First, we highlight the role of bond supply effects (Lou, Yan, and Zhang, 2013; Greenwood and Vayanos, 2014; Vayanos and Vila, 2021) in shaping asset price dynamics around central bank announcements. Second, we additionally exploit transaction-level data to study the role of traders' behaviour in explaining the observed price patterns around monetary announcements. Most papers that study pre-announcement price drifts tend to use aggregate data, which limits the identification of the mechanism at play. Third, our theoretical contribution is to develop a model which captures both the changing composition of liquidity providers before informational events and how prices can be affected by the interaction between asset supply and informational events. Existing theoretical justifications are typically silent on the drivers of the particular uncertainty before central bank announcements and how it resolves (e.g., Hu, Pan, Wang, and Zhu, 2022). Ai, Bansal, and Han (2021) and our paper highlight the role of informed traders before central bank announcements. Differently from Ai, Bansal, and Han (2021), we additionally model inventory costs of uninformed traders such as dealers stemming from their balance sheet constraints. We show that the pre-announcement developments in the aggregate and the transaction-level data can be rationalized only if one views pre-announcement periods as periods in which dealers become particularly inventory averse, beside being an information event.

Our paper is also related to the literature that highlights the role of dealers' balance sheet constraints in liquidity provision, and analyses changes in the tightness of these constraints since the Great Recession and related price effects in government bond markets (Duffie, 2020; Augustin, Chernov, Schmid, and Song, 2021; He, Nagel, and Song, 2022; Du, Hebert, and Li, 2022).[7,8] Our paper's contribution to this literature is to demonstrate that periods in which dealers are desperate to sell to the client sector and in which clients are particularly averse to buying may overlap, such as during pre-announcement windows after a primary issuance. This points to a potential need for communication and strategic interaction between monetary and fiscal authorities to determine the optimal way of timing bond issuances around monetary policy announcements.

The remainder of the paper is organised as follows. Section 2 describes the sources for our aggregate and transaction-level data; Section 3 presents the baseline results based on aggregate data; Section 4 presents the results from our transaction-level analysis; Section 5 describes our theoretical model; Section 6 concludes.

[7] For related analysis on corporate bond markets, see Adrian, Boyarchenko, and Shachar (2017); Bao, O'Hara, and Zhou (2018); Bessembinder, Jacobsen, Maxwell, and Venkataraman (2018) and references herein. See also the theoretical papers by Gertler and Kiyotaki (2010); He and Krishnamurthy (2013); Brunnermeier and Sannikov (2014); Drechsler, Savov, and Schnabl (2018) among others that explore business cycle implications.

[8] There is also a literature that highlights the role of dealers' market power (An and Song, 2020; Eisenschmidt, Ma, and Zhang, 2022; Pinter and Uslu, 2022). We instead model perfectly competitive dealers with exogenous inventory costs stemming from their balance sheet constraints.

2 Data

2.1 Monetary Policy Committee Meetings

Our sample starts in 1997 when the Bank of England gained operational independence. Since then, the Monetary Policy Committee (MPC) has been responsible for conducting monetary policy in the UK.[9] The MPC comprises 9 members: the Governor, three Deputy Governors, the Chief Economist, and four external members appointed by the Chancellor of the Exchequer. Scheduled MPC meetings in the first part of our sample were organised every month, followed by a reduction in the frequency of scheduled meetings in recent years. After each meeting, the decisions with regard to the policy rate are announced at 12:00pm, typically on the first or the second Thursday of the given month. Our full sample covers 6128 trading days over the period 1997m6-2021m6, which includes 270 scheduled meetings.[10]

2.2 Government Bond Issuance

Data on government bond issuance are from the Gilt Issuance Calendars published by the Debt Management Office (DMO). We use the historical yearly reports, corresponding to a given financial year, that include information on the operation date, instrument name, nominal amount issued, cash raised, and issuance method.[11] From the 6128 trading days in our sample, 671 (336) days coincide with issuances of nominal (inflation-linked) government bonds. A key motivation behind our study is the fact that a large number of MPC decisions occur 1-2 days after issuance of government bonds. From the 270 scheduled MPC meetings, 31 (22) meetings occur one day after the issuance of nominal (inflation-linked) government bonds; and 96 (27) meetings occur two days after the issuance of nominal (inflation-linked) government bonds. In total, 147 of the 270 scheduled MPC meetings occur on days that come after a 2-day period (Tuesday or Wednesday of the week with MPC meetings) during which new government bonds were issued.

The concurrence of pre-MPC windows and issuances has increased as the frequency of government bond issuances has risen. To show this, Figure 1a shows the time-series of the number of days in a given calendar year that coincided with new bond issuances. The number has steadily increased from around 10 issuance days in 2000 to around 50 yearly issuance days in recent years (exceptions include the crisis years of 2009 and 2020). Given the increased issuance activity, the concurrence of pre-MPC windows and bond issuances has increased markedly, especially after 2004 (Figure 1b). For example, the years 2009, 2011, and 2014 saw all pre-MPC windows coinciding

[9] Guidelines for the creation of the MPC were laid out in the Bank of England Act 1998.

[10] The 270 meeting dates are presented by Table 9 in the Appendix. Further information on historical MPC meetings can be found on the Bank of England website.

[11] The data can be downloaded from the DMO's website. Data on issuances pertaining to the period before April 1998 were obtained from the Bank of England.

with new bond issuances.

2.3 *Bond Yields*

We use data at daily frequency on zero coupon bond yields on UK government bonds, as constructed by the Bank of England.[12] This includes nominal and real yield curves and the implied inflation term structure for the UK, that are derived using spline-based techniques (Anderson and Sleath, 2001). In our baseline regressions, we use data for yields at maturities of 5, 10, 15, and 20 years. To decompose daily yields into term premia and expectations components, we use a dynamic no-arbitrage affine term structure model, estimated by linear regression techniques (Adrian, Crump, and Moench, 2013; Malik and Meldrum, 2016) as summarised by Section A.3 of the Appendix. We use as factors the first five principal components of the yield curve. We estimate the factor loadings at monthly frequency, and combine these estimates with the daily time-series of the factors to obtain daily estimates of term premia and expectations components. The obtained decomposition is similar to recent estimates of the UK term structure (Moench, 2019).

2.4 *Transaction-level Data*

To study the microstructure of UK bond markets around monetary policy announcements and primary issuances, we use a detailed transaction-level dataset which contains information on the identity of both sides of a trade. The ZEN database covers the period between August 2011 and December 2017, and MIFID II database covers the period from January 2018 to December 2019. Both datasets are sourced by the UK Financial Conduct Authority, and contain information on client and dealer identities along with information on the transaction time, the transaction price and quantity, the International Securities Identification Number, the account number, and buyer-seller flags.[13]

Our analysis focuses on transactions that occur between clients and designated market makers, called Gilt-Edged Market Makers (GEMMs). GEMMs are the primary dealers in the UK government bond market, and the majority of client-dealer trades are intermediated by them.[14] After filtering out all duplicates and erroneous entries, we are left with approximately 3.5 million observations for government bond market trades, nominal bond transactions making up for about two

[12]The data can be downloaded from the Bank of England's website.

[13]For further details on the Zen dataset, see the Transaction Reporting User Pack: https://www.fca.org.uk/publication/finalised-guidance/fg15-03.pdf. For further details on the MIFID II dataset, see the Reporting Guidelines: https://www.esma.europa.eu/sites/default/files/library/2016-1452_guidelines_mifid_ii_transaction_reporting.pdf. Recent applications of the datasets can be found in Czech, Huang, Lou, and Wang (2021); Pinter, Wang, and Zou (2021); Kondor and Pinter (2022); Pinter and Uslu (2022) among others.

[14]For further details on the identities of GEMMs, see https://www.dmo.gov.uk/responsibilities/gilt-market/market-participants/.

thirds of theses trades and inflation-linked bond trades accounting for the remaining one third. We identify around 600 clients that cover the majority of trading volume between clients and dealers in both segments of the government bond markets. We classify these clients by various types as detailed further below.

3 Interest Rate Drifts before MPC Meetings

3.1 Summary Statistics

Table 1 presents some summary statistics for our aggregate dataset. Panel A shows that the mean issued amount is $3 billion and $1.15 billion for nominal and inflation-linked bonds, respectively. Looking at the two subsamples, 1997-2007 and 2008-2021, reveals that both the average issue size and issuance frequency have increased markedly. The mean issued amount of nominal bonds grew from $2.5 billion to $3 billion, whereas the mean issued amount of inflation-linked bonds grew from $550 million to $1.4 billion. Panel B of Table 1 presents summary statistics on the years to maturity of issued nominal and inflation-linked bonds, with mean values of 17 years and 24 years, respectively. Panel C of Table 1 summarises our dataset on daily yield changes, which will be used as dependent variables in the analysis below. Daily changes in yields average around -0.1 bps in our sample, which amounts to a more than 6 percentage points decline in our sample (of 6126 trading days), consistent with the secular decline in interest rates during this period.

3.2 Baseline Results

This section starts by documenting that there is a systematic increase in long-term UK government bond yields during a 2-day window before MPC meetings. To estimate the baseline effect, we run the following daily regression:

$$\Delta_{t-1,t} r_k = \beta_0 + \beta_1 D_t^{MP} + \varepsilon_t, \tag{3.1}$$

where $\Delta_{t-1,t} r_k$ is the daily change in yield with maturity k, β_0 is a constant and $D_{MP,t}$ is an indicator variable which takes value of one during the pre-MPC window (i.e. on days that are either one or two days away from the MPC meeting) and zero otherwise. The estimated value of β_1 is the coefficient of interest, which captures the pre-MPC drift. Panel A of Table 2 presents the results separately for yields with 5, 10, 15, and 20 years of maturities. We find that all the coefficients are positive, but the pre-MPC drift is statistically insignificant at the shortest maturity. The results indicate that the average daily increase in 10-, 15-, and 20-year yields during the pre-MPC window is about 0.45-0.51 bps larger than yield changes outside pre-MPC windows. The constant is estimated to be about -0.15 bps, which is consistent with the secular decline in interest rates during this period.

To analyse the role of debt issuance, we place all available pre-MPC windows in our dataset into two groups: one that coincides with new issuances of either nominal or indexed-linked government debt and the remaining pre-MPC without debt issuance. We thereby extend regression (3.1) as follows:

$$\Delta_{t-1,t} r_k = \beta_0 + \beta_1 D^{MP}_{ISS,t} + \beta_2 D^{MP}_{noISS,t} + \beta_3 D^{noMP}_{ISS,t} + \varepsilon_t, \tag{3.2}$$

where $D^{MP}_{ISS,t}$ is an indicator variable which takes value one when the pre-MPC period coincides with debt issuance and zero otherwise; similarly, $D^{MP}_{noISS,t}$ indicates pre-MPC periods without debt issuance; $D^{noMP}_{ISS,t}$ serves as a control variable indicating days with issuance and without MPC meetings.

Panel B of Table 2 presents the estimated coefficients for model (3.2) for the four different maturities. We find that the effects are both economically and statistically significant during pre-MPC windows with debt issuance. During these windows, changes in 15- and 20-year yields tend to be about 0.65 bps larger. To further illustrate the role of debt issuance in driving the pre-MPC drift, we modify regression (3.2) by focusing on issuances that are above the median (in the given year) in terms of nominal value issued—referred to as large issuances. Panel C of Table 2 shows that the estimated β_1 coefficients rise further, and they are now around 1.01-1.05 bps for 15- and 20- year yields.

We also check whether these results are robust to including the first and second lags of yield changes in these regressions. Table 11 in the Appendix re-estimates the models above and shows that the additional controls make little difference to our baseline results.

Unscheduled MPC Meetings The results so far are based on scheduled MPC meetings. During our sample period, there were three unscheduled interest rate announcements that typically occurred during high-volatility periods (September 18, 2001; March 11, 2020; March 19, 2020). To check the effect of unscheduled MPC meetings on our results, we extend our sample of pre-MPC windows accordingly, and re-estimate our regressions. Table 10 shows that our baseline results are statistically and economically stronger, which is driven by the announcements during the COVID-19 crisis period.

Visual Illustration To visually illustrate the pre-MPC drift, we construct hypothetical time-series (in the spirit of Hillenbrand, 2020) based solely on 20-year yield changes that realised during the 2-day period before MPC meetings, assuming that yield movements outside these periods were zero. Similarly, we construct hypothetical time-series that take into account changes in the 20-year yield only outside pre-MPC windows. The two hypothetical time-series along with the cumulative changes in the realised 20-year yield are presented in Figure 2. The solid green line is linear trend fitted on the pre-MPC drift series. The results highlight that the pre-MPC drift is sizeable, amounting to a cumulative effect of around 2% over the 1997-2021 period. As a comparison, cumulative changes in realised yields amount to -6.5% during this period.

To see how different starting points would change the picture, we reconstruct the hypothetical time-series using 2005 as the starting point as shown by Figure 3a. In addition, we construct the hypothetical time-series that are based solely on 20-year yield changed that realised during those pre-MPC windows that coincided with new debt issuances. Similarly, we construct hypothetical time-series that take into account changes in the 20-year yield only outside those pre-MPC windows that coincided with new debt issuances. Figure 3b shows the results from this exercise. The similar dynamics of the cumulative pre-MPC drifts in Figure 3a and 3b highlight the important role of debt issuance in driving the pre-MPC drift.

Daily Yield Changes around MPC Meetings In our baseline estimation, we compare yield changes during a two-day period before MPC meetings to daily yield changes on other days. Here we take a closer look at whether individual days around MPC meetings feature significant yield changes by estimating variants of regressions 3.1–3.2. Table 12 shows how significantly different daily changes in 20-year yields are on selected days around MPC meetings compared to other days. Within each panel of the table, each column shows regression coefficients together with t-statistics based on robust standard errors. For example, column 4 shows the regression results corresponding to changes in yields based on end-of-day closing prices on the day before MPC meetings $(t-1)$ and closing prices on MPC days (t).

Consistent with our baseline results, we find that all of the statistically significant coefficients concentrated on one day and two days before MPC days, with yield changes on all other selected days being not statistically different from yield changes in the rest of the trading days. This suggests that there is no clear reversal of the pre-MPC drift after the MPC announcement. Moreover, the table 12 also confirms the importance of (large) bond issuances during pre-MPC windows, which is where the pre-MPC drift concentrates.

In addition, we also check with the pre-MPC drift is correlated with the realisation of the monetary policy surprise. To that end, we follow Cesa-Bianchi, Thwaites, and Vicondoa (2020) in identifying UK monetary policy surprises and check whether average yield changes during pre-MPC windows are different depending on whether the monetary policy shock turns out to be expansionary or contractionary.[15] We find no statistical evidence on such a differential yield drift in pre-MPC windows (see Table 13 of the Appendix).

[15] Cesa-Bianchi, Thwaites, and Vicondoa (2020) (building on Miranda-Agrippino (2016), Gerko and Rey (2017) and related papers) looks at movements in the price of 3-month Sterling futures contracts in a 30-minute window around the interest rate announcement of the Bank of England. An increase (decrease) in the price is regarded as a monetary policy expansion (contraction). We end up with 258 pre-MPC windows and 516 trading days for the period spanning June 1997 to December 2019.

Timing of Issuance around MPC Meetings Given the importance of bond issuance in driving the pre-MPC drift, an interesting question is whether the issuance decision is strategically timed with respect to scheduled MPC announcements. There is an obvious interaction in that almost none of the primary issuances are scheduled by the Debt Management Office on days with MPC meetings. However, as discussed in Section 2.2, a non-negligible number of issuances occur in the pre-MPC windows. The question arises whether the amount of issuances might be systemically different on days around MPC meetings compared to other periods. It might be that the risk premium effect we find in pre-MPC windows might be the result of disproportionately larger issuances in these periods.

To check this, we compute total weekly issuances (in nominal bonds, inflation-linked bonds and both types of bonds) and estimate whether the issued amount is statistically different on weeks with scheduled MPC meetings compared to weeks without MPC meetings. Table 14 presents the results, indicating that total issuance in the whole sample is statistically the same during weeks with and without MPC meetings. There is some statistically significant evidence there the issuance of linkers is lower during MPC weeks, which is driven by the middle part (2005-2012) of our sample.

A Decomposition: Risk Premia vs Expectations Next, we test whether the pre-MPC drifts of yields can be linked to an increase in risk premia or to higher expectations about the future path of the short-term interest rate. To that end, we use a dynamic no-arbitrage affine term structure model, estimated by linear regression techniques (Adrian, Crump, and Moench, 2013; Malik and Meldrum, 2016), and decompose the 10-year yield into estimated term premium and expectations components.[16] We then employ these time-series as left-hand side variables in our baseline regressions (3.1)–(3.2). The results are presented in Table 3.

Panel A of Table 3 shows that the majority of the pre-MPC drift in the 10-year yield (0.45 bps) is driven by the term premium component (0.38 bps) which is strongly statistically significant. The expectations component is small (0.07 bps) and statistically insignificant. Consistent with this and with the evidence in Table 2 above, Panel B of Table 3 confirms that the interaction between the debt issuance and the pre-MPC drift manifests entirely in term premia with the corresponding β_1 coefficient (0.61) being highly significant. The results are similar when we look at large debt issuances, as presented in Panel C of Table 3.

Nominal vs Real Yields Moreover, we re-estimate our baseline regressions using real (instead of nominal) yields as left-hand-size variables. Tables 16–18 in the Appendix show that the results are somewhat weaker for real yields. The interaction of pre-MPC windows and issuance (especially of large sizes) continues to yield statistically significant effects. We also check whether these

[16] See Section A.3 of the Appendix for a description of the term structure model.

interaction effects are driven by nominal or inflation-linked bond issuances, and find stronger evidence for the former.

Is the pre-MPC Drift due to Chance? One concern is that the pre-MPC drift in interest rates may be due to chance. That is, there could be a series of other 2-day windows in our sample where economic forces generate price movements similar to what we observe in pre-MPC windows. This raises the question whether there is anything special about pre-MPC windows and whether there is a reasonable possibility that one could observe a similar pattern outside pre-MPC windows by chance. To address this, we carry out the following Monte Carlo simulation as a placebo test. We randomly select a day in each month which featured an MPC meeting, and compute the cumulative yield drift in the 2-day window before these randomly selected days. We repeat this exercise 1000 times to generate 1000 cumulative (placebo) changes in the 20-year yield. Figure 4 illustrates that the probability of observing a yield increase as large as the yield increase we observe during actual pre-MPC windows (red line) is negligible.

Interpretations The interpretation we propose to explain the empirical facts is related to the limited risk-bearing capacity of dealers and of other liquidity providers during government bond issuances, which becomes more pronounced when the issuance is closely followed by an informationally sensitive period such as an interest rate announcement. Primary dealers in the UK are obliged to play an active role in the issuance and distribution of UK government debt (DMO, 2021).[17] Fulfilling this obligation before central bank announcements poses an additional risk to the dealer sector, whose balance sheet constraints have tightened since the Great Recession (Adrian, Boyarchenko, and Shachar, 2017; Bessembinder, Jacobsen, Maxwell, and Venkataraman, 2018; Bao, O'Hara, and Zhou, 2018). A fresh supply of bonds in the pre-MPC window thereby increases dealers' risk exposure to interest rate changes, which could incentivise dealers to distribute the new issuance among clients as quickly as possible. If clients have elastic demand for these bonds as well as limited risk-bearing capacity, then they would require a risk premium in exchange of providing liquidity to the dealer sector. It could also be that the dealer sector will hold onto the new issue at a premium. (We will use transaction-level data to study these possibilities.) Both explanations could explain why bond prices fall in the pre-MPC window when there is a concurrent issuance of government bonds. Importantly, if limited risk-bearing capacity of dealers and liquidity providers is relevant factor driving the pre-MPC drift, then we should find that most of the effects on yields load on the risk premium component of interest rates. The evidence presented in Table 3 is therefore important, because it confirms that all of the pre-MPC drift we find relates

[17] Specifically, primary dealers should aim to purchase at least 2.0% of gilt issuance by sector, conventional and index-linked, on a six-month rolling average basis. Moreover, it is expected that each wholesale dealer's bids would amount to the equivalent of at least 5.0% of the amounts issued, calculated on a six-month rolling average basis (p. 4 of DMO (2021)).

to increases in term premia instead of higher expectations about future short-term interest rates.

3.3 Evidence from the US

In a recent paper, Hillenbrand (2020) documents that a narrow window around monetary policy meetings of the Fed captures the secular decline in nominal long-term interest rates over the last three decades. This appears to be counter to the effect that we analyse in this paper. This section performs a consistency check and argues that the effect we identify using UK data is present in the US as well.

Figure 8a carries out the analysis of Hillenbrand (2020) for the period 1989m6-2019m12, confirming his baseline result that a 3-day window around FOMC meetings fully captured the decline in interest rates of the last decades.[18] The interpretation put forth is that FOMC meetings provide information to the market about the long-term interest rates, even though the Fed does not have direct control over these rates. This information effect would suggest that the market learned about the secular decline in interest rates from the Fed.

At first sight, this seems in contrast with the pre-MPC drift documented for the UK by Figure 2. However, we argue that the effect our paper studies, pertaining to the interaction between bond issuance and central bank announcements, is present in the US as well. To that end, we first note that out of the 268 FOMC meeting windows in the sample, 88 of them coincide with issuance of nominal government bonds with more than four year of maturity, and the remaining 180 FOMC windows have no concurrent issuance of such Treasuries. Following our analysis above, Figure 8b splits the FOMC meeting windows into two groups: one set of meetings that coincide with such new issuances and the remaining set of windows without issuances. We find that all of the downward drift in long-term yields concentrates in FOMC windows without issuances, as shown by the red line. In contrast, there is no visible change in long-term yields during one third of all FOMC windows in our sample that coincide with new issuances of longer term bonds. These results provide an important extension to the findings of Hillenbrand (2020), suggesting that the interaction between FOMC windows and bond supply effects seems to generate a countervailing force which offsets some of the proposed learning effect associated with the downward drift in interest rates.

Given that the mechanism highlighted in our paper works via risk premia due to the interaction between agents' limited risk bearing capacity and supply effects in the vicinity of information events, it is natural to decompose the term premium component of the FOMC drift. Hillenbrand (2020) finds little cumulative decline in the term premium estimates around the 3 days around FOMC meetings. We corroborate this finding in Figure 9a, and add to this evidence by decom-

[18]The data on nominal US treasury yields are obtained from the updated dataset of Gurkaynak, Sack, and Wright (2007).

posing the drift in the term premium that are attributed to FOMC meetings with and without concurrent Treasury issuances. Figure 9b shows that there is a positive cumulative change in term premia during FOMC windows that coincide with Treasury issuance (consistent with the UK evidence), and the cumulative change has been negative during FOMC windows without issuance. The divergence in the two hypothetical series occurs after the Great Recession when primary dealers' risk-bearing capacity became more limited (Adrian, Boyarchenko, and Shachar, 2017; Bessembinder, Jacobsen, Maxwell, and Venkataraman, 2018; Bao, O'Hara, and Zhou, 2018) and the total amount of marketable Treasuries started outgrowing dealers' intermediation capacity (Duffie, 2020).

4 Transaction-level Analysis

To better understand the dynamics of bond prices during the pre-MPC window, we use transaction-level data to study how different types of clients trade after primary issuances (during and outside pre-MPC windows) with a special emphasis on identifying client types who act as liquidity providers to the dealer sector.

4.1 Summary Statistics

Using all available transactions from the client-dealer segment of the market, we group clients into six sectors following the classification of Czech, Huang, Lou, and Wang (2021): commercial banks, pension fund and insurance companies, foreign central banks, hedge funds, asset managers and other services.

Table 4 summarises the average daily activity of all clients as well the activity of the six sectors, using three different measures: turnover, orderflow (buy volume net of sell volume) and number of transactions. Average client turnover is about $7 billion on a trading day, with the majority of turnover generated by asset managers ($2.3 billion) and hedge funds ($1.7 billion) that together account for 56.9% of daily turnover in our sample. The client sector as a whole is a net buyer of gilts with a daily order flow of $230 million, that is mainly driven by purchases of asset managers ($89 million), government entities ($81 million), pension funds and insurance companies ($62 million). There are about 1,011 daily transactions in the dealer-client segment of our sample with the majority generated by asset managers. It is interesting to note that government entities trade very infrequently (2.8% of all client trades), but they generate more than a third of total client orderflow. This is consistent with government entities trading in extremely large quantities.

4.2 Liquidity Provision After Primary Issuances

Having summarised the average gilt-market behaviour of the different sectors, we now look at how their behaviours might change following primary gilts issuances during and outside pre-MPC windows. Table 5 shows the average daily orderflow of each of the six client types on three sets of trading days. Our sample includes 2105 trading days, which we decompose into (i) 93 days that fall in pre-MPC windows with issuance days, (ii) 465 days that are outside pre-MPC windows but on issuance day or the day after the issuance day, and (iii) the remaining 1547 days without new issuance.

Inspecting columns (1) and (4) of Table 5 reveals that clients buy government bonds worth around \$448 million from dealers following primary issuances outside pre-MPC windows. The majority of this liquidity provision is done by hedge funds (\$131 million) and asset managers (\$189 million) which together make up around 71.3% of the purchase of the client sector on these trading days. Existing literature shows that these two client types are more likely to trade for informational reasons than other clients (Kondor and Pinter, 2022) and they are also known to have the ability to predict future bond returns (Czech, Huang, Lou, and Wang, 2021).[19] Government entities are the third largest liquidity providers (\$86 million) followed by pension funds and insurance companies (\$23 million), commercial banks (\$11 million) and other services (\$8 million).

Compared to these results, we find two notable changes when we look at issuances days during pre-MPC windows, as shown by columns (2) and (5) of Table 5. First, the dealer sector is selling more bonds to clients (\$594 million vs \$448 million). Second, the composition of liquidity provision changes considerably: hedge funds (\$27 million) and asset managers (\$172 million) now make up only around 33.6% of the purchase of the client sector on these trading days, while all other clients step in to increase their liquidity provision to the dealer sector during these trading days. Government entities (\$181 million) appear to be the largest liquidity providers, account for 30.5% of daily bond purchases in this period.

Columns (3) and (6) of Table 5 show that the average daily orderflow of the client sector is more modest (\$142 million) on the remaining trading days. Government entities (\$74 million), pension funds and insurance companies (\$74 million) appear to be the largest net buyers of bonds during this period.

To sum up, the client sector's liquidity provision is sizeable during the 2-day period after primary issuances, and the dealer sector seems to demand more liquidity from clients when there is an impending MPC meeting. This is consistent with the limited capacity of the dealers to bear interest rate risk. It is important to note that the higher selling activity of the dealers is not driven by the issue size being systematically larger in pre-MPC windows. We checked and did not find any significant difference between the average issue size during and outside pre-MPC windows. If

[19] An important question is when exactly these clients trade on information. In Section 4.3, we shed light on this question by studying when these clients' trades correctly predict future return.

anything, the issue size seems somewhat smaller in pre-MPC windows ($1.42 billion) compared to outside pre-MPC windows ($1.50 billion). However, the composition of liquidity providers seems to change markedly depending on whether the issuance is followed by interest rate announcements: asset managers and hedge funds provide the majority of liquidity in the absence of MPC meetings, whereas the four remaining client sectors provide the majority of liquidity to the dealer sector during pre-MPC windows.

To test whether these results are statistically significant, we use linear regressions estimated separately for each client sector. Figure 5 shows the estimated difference in liquidity provision (after issuances) with and without impending MPC announcements. We find that the daily increase (decrease) of around $100 million in liquidity provision by government entities (hedge funds) is statistically significant at the 95% level.

In addition, we explore how the results change when the pre-MPC window coincides with large bond issuances, defined as issues above the year-specific median issued amount (as in Section 3.2). Figure 6 shows that the dealer sector's selling activity is significantly larger during pre-MPC windows compared to post-issuance periods without impending MPC meetings. Again, we check whether this might be driven by issue sizes being systematically larger in pre-MPC windows. We find that this is not case: the mean size of large issuances is $2.80 billion in pre-MPC windows and $2.98 billion outside these periods. Yet, as shown by Figure 6, the dealer sector's daily selling activity (after large issuances) is larger by about $300 million in pre-MPC windows compared to other periods. This provides further empirical support for the narrative that dealers are more inclined to off-load newly purchased bonds at primary auctions (given it is one of their obligations as GEMMs) to the client sector when facing higher interest rate risk before MPC meetings.

Regarding client behaviour after large issuances, the right panel of Figure 7 shows the estimated difference in liquidity provision (with and without impending MPC announcements) for each of the six client sectors, along with our baseline estimates (left panel) estimated after all issuances. We find that government entities, pension funds, insurance companies, and other clients significantly increase their liquidity provision to the dealer sector, whereas hedge funds reduce their liquidity provision by buying significantly less during pre-MPC windows compared to other periods with large issuances.

4.3 Trading Activity of Hedge Funds

Why do hedge funds reduce their liquidity provision to the dealer sector after primary issuances, when there is an upcoming monetary policy announcement? A natural explanation we explore is that hedge funds have weaker incentive to commit to an unconditional long position (by buying the new issuance) before the arrival of MPC announcement compared to issuances without impending MPC meetings. This may happen for two reasons. First, hedge funds may have informational signals about the MPC meeting by the time the issuance occurs. Assuming that the signal is negative half the time, hedge funds would on average buy less after the auction given that their signals would (half the time) require them to take short positions. Second, hedge funds may not yet have informational signals about the upcoming MPC meeting by the time the issuance occurs, but they are expecting to receive such signals shortly. Assuming that there are costs to making large portfolio adjustment after the issuance and before the MPC meeting because of information asymmetry-induced illiquidity, for example, hedge funds may choose to participate less actively to provide liquidity during issuance.

To disentangle these two explanations, we take a closer look at the timing and performance of hedge funds trades in pre-MPC windows that coincide with primary issuance of government bonds. To measure trading performance, we follow Di Maggio, Franzoni, Kermani, and Sommavilla (2018) by computing the T-day-horizon return on each hedge fund trade on day t, measured as the percentage difference between the transaction price and a benchmark price T days after the transaction date.[20] Formally, for each trade j, we construct the measure $Performance_j^T$ as follows:

$$Performance_j^T = \left[\ln\left(P^T\right) - \ln\left(P_j^\star\right)\right] \times \mathbf{1}_{B,S}, \tag{4.1}$$

where $P_j^\star$ is the transaction price, P^T is the T-day ahead median transaction price of the corresponding bond, and $\mathbf{1}_{B,S}$ is an indicator function equal to 1 when the transaction is a buy trade, and equal to -1 when it is a sell trade. All transaction-specific returns are then averaged within day t for the hedge fund sector. We compute both unweighted average as well as weighted average using the pound sterling volume of the trades as weights.

Table 6 presents the unweighted and weighted performance measures over 1-, 3-, and 6-day horizons during pre-MPC windows as well as on days of MPC decisions. We find that during these periods, hedge fund trades that predict future price movements occur predominantly on the day of the MPC meeting. For example, the unweighted 6-day performance measure of trades executed on the day of the MPC meeting is around 13.22 bps which is almost five times as large as the estimated performance outside pre-MPC windows (2.76 bps). The unweighted performance measures on these days are economically and statistically stronger than the weighted counterparts, suggestive of smaller hedge fund trades performing better than larger ones during this period. Importantly, hedge fund trades in the 2-day period before MPC meetings and after issuance seem less informative to the extent that both weighted and unweighted performances measures statistically insignificant with point estimates often negative. An exception is the 1-day performance measure on issuance day (two days period to the MPC meeting) which is positive and statistically

[20] The T-day horizon starts at the start of each day and ends after T days. We use overlapping time windows. For example, to compute one-day performance measures ($T = 1$), we compare all trades on day 1 to the volume-weighted average price on day 2, and compare all trades on day 2 to the volume-weighted average price on day 3, and so on.

significant using the volume weighted measure. This is suggestive of some hedge fund "riding" the price drift that occurs before the MPC meeting.

Overall, the empirical evidence regarding the timing of profitable hedge fund trades seems to support the idea that hedge funds receive informational signals about the nature and the effect of MPC decisions after the issuance takes place.[21] In the next section, we propose a theoretical model which can rationalise that informed clients could refrain from providing liquidity to the dealer sector after new issuance of bonds when there is an upcoming monetary policy announcements.

5 Theory

In this section, we provide a theoretical model to illustrate the mechanics of secondary-market trading following a government bond issuance and prior to the revelation of a monetary policy shock. Importantly, we are not after presenting a full-fledged, structural model amenable to realistic calibration. Instead, we develop an illustrative framework so that the reader can make sense of our empirical findings by looking at them through the lens of our theoretical framework.

5.1 Model Environment

There are two trading dates, $t \in \{1, 2\}$, and one divisible risky asset whose random payoff, $\tilde{v}$, realizes after trading at $t = 2$. There are three types of agents: a unit-mass continuum of dealers (D), a unit-mass continuum of uninformed clients (UC), and an atomic hedge fund (HF). Each dealer and uninformed client are of zero measure, while the hedge fund has a normalized measure of one, and so, the total mass of agents in the economy equals three. We think of the risky asset as a government bond subject to interest rate risk, which is issued shortly before trading at $t = 1$. Each dealer obtains $z \in \mathbb{R}_{++}$ shares of the asset in the primary market. Uninformed clients and the hedge fund do not participate in the primary market. Hence, once secondary-market trading starts at $t = 1$, each dealer has an endowment of z shares, and uninformed clients and the hedge fund 0. We assume that these endowments are public information and that there is no further issuance of the asset.

All agents are risk neutral and none of them discount the future. Dealers and uninformed clients are also subject to quadratic inventory costs from their post-trade holdings of the risky asset at $t = 1$ and $t = 2$. The hedge fund does not have such an inventory cost. All agents have homogeneous expectations about the asset payoff at $t = 1$: $\mathbb{E}[\tilde{v}] = v$. Just prior to trading at $t = 2$, the hedge fund privately learns in advance the true realization, $\tilde{v}$, of the asset payoff but other agents, dealers and uninformed clients, do not receive such a private information. However,

[21] We also calculate the trade performance measure for the dealer sector as well as for other clients that are not hedge funds. Tables 7–8 show that there is little evidence that the trading performance of other clients or dealers is significantly different during pre-MPC windows compared to regular trading days.

dealers and uninformed clients understand that the equilibrium price at $t = 2$ reflects information about the hedge fund's demand, and in turn, about the asset payoff $\tilde{v}$. We will describe the details of this information revelation by the market price at $t = 2$ in the next section as part of the equilibrium definition.

5.2 Equilibrium Definition

In this subsection, we define a dynamic trading equilibrium for the economy described above. Our equilibrium concept and the economics behind it build on Grossman and Stiglitz (1980), Kyle (1985), and Kyle (1989). First, the equilibrium price at $t = 2$ has two simultaneous roles as in Grossman and Stiglitz (1980): clearing the market and acting as a public signal about the informed party's actions. Second, because the informed party in our economy, the hedge fund, is a large player, she internalizes her impact on the market price when making her trading decisions as in Kyle (1985) and Kyle (1989).

In what follows, the term "agent" refers to an infinitesimal competitive representative of the particular type for dealers and uninformed clients, while the hedge fund is a unique agent with a positive mass. Agent $i \in \{D, UC, HF\}$ makes decisions to maximize her expected utility defined as

$$\mathbb{E}_t^i \left[Utility^i \right] = \mathbb{E}_t^i \left[Wealth_2^i - \frac{\gamma_i}{2} \left(D_1^i \right)^2 - \frac{\gamma_i}{2} \left(D_2^i \right)^2 \right], \tag{5.1}$$

where $\mathbb{E}_t^i$ denotes the expectation with respect to agent i's information set at time t, D_t^i agent i's post-trade asset holding at time t, and γ_i agent i's inventory cost parameter. Thus, our agents are subject to reduced-form inventory holding costs as in Almgren and Chriss (2001), Antill and Duffie (2021), and Garriott, van Kervel, and Zoican (2022). We assume that $\gamma_D, \gamma_{UC} > 0$, while $\gamma_{HF} = 0$. With this assumption, we aim to capture that dealers and uninformed clients such as mutual funds and index funds may be subject to regulatory capital requirements, collateral requirements, as well as sudden withdrawals, which may lead to a costly liquidation of their inventory, while hedge funds are less subject to such costs.

The dynamic nature of trading in our model stems from the fact that agents make their trading decisions at $t = 1$ by anticipating the equilibrium trading decisions at $t = 2$. Because all agents have the same information set at $t = 1$, they choose their post-trade holdings, D_1^i for $i \in \{HF, D, UC\}$, to maximize (5.1) under symmetric information. While small agents, dealers and uninformed clients, do their optimization by taking the price, P_1, as given, the hedge fund internalizes her price impact. That is, the hedge fund chooses D_1^{HF} to maximize (5.1) by taking a pricing function as given: $P_1 = \hat{P}_1^0 + \hat{P}_1^1 D_1^{HF}$ for constants $\hat{P}_1^0$ and $\hat{P}_1^1$. In turn, the market-clearing condition pins down $\hat{P}_1^0$ and $\hat{P}_1^1$.

As the economy moves to the second trading stage, which is at $t = 2$, the post-trade holdings at $t = 1$, D_1^{HF}, D_1^D, and D_1^{UC}, become the economy's state variables. That is, as is standard in dynamic models, trading strategies at $t = 2$ are, in principle, functions of those state variables inherited from $t = 1$. In addition to those three variables, the hedge fund also has the realization of the asset payoff, $\tilde{v}$, as her fourth state variable. Hence, this informational advantage of the hedge fund is an additional trading motive for her that was not present in the previous round.

To make the market price at $t = 2$ only imperfectly revealing the true motivation behind the hedge fund's demand, we subject the hedge fund's decision at $t = 2$ to a "trembling hand." The hedge fund's optimal post-trade holding at $t = 2$ is $D_2^{HF} = \mu + \tilde{\epsilon}$ where μ is chosen by the hedge fund and the random variable $\tilde{\epsilon}$ that is independent of $\tilde{v}$ realizes from a mean-zero normal distribution with variance b^2 for some $b > 0$.

Similar to the first trading round at $t = 1$, we guess (and later verify) that the market-clearing price at $t = 2$ takes the form $P_2 = \hat{P}_2^0 + \hat{P}_2^1 D_2^{HF}$ for constants $\hat{P}_2^0$ and $\hat{P}_2^1$. Thus, by observing P_2, dealers and uninformed clients learn perfectly the noisy demand, D_2^{HF}, of the hedge fund. We assume that, in the calculation of the conditional expectation of their payoff, an uninformed agent $i \in \{D, UC\}$ uses the following information revelation function:

$$\mathbb{E}_2^i [\tilde{v}] = \mathbb{E}\left[\tilde{v} \mid D_2^{HF}\right] = v + \lambda D_2^{HF}, \tag{5.2}$$

where $\lambda > 0$ is an exogenous parameter that captures the severity of asymmetric information. For example, if there is a lot of uncertainty regarding the upcoming monetary policy shock, it means λ is larger.[22] This noisy demand structure coupled with the linear information revelation function (5.2) is also used in the limit-order book models of Sandås (2001) and Garriott, van Kervel, and Zoican (2022). One crucial difference between our model and theirs is that our model is a general equilibrium model in which prices are determined endogenously, while their models are partial equilibrium limit-order book models in which liquidity providers choose the depth they are willing to provide in the order book at an exogenous sequence of prices.

Taking stock, at $t = 2$, the hedge fund chooses her mean post-trade holding μ by taking as given the pricing function $P_2 = \hat{P}_2^0 + \hat{P}_2^1 D_2^{HF}$, and so, by internalizing her impact on the market price. Dealers and uninformed clients choose their post-trade holdings, D_2^i for $i \in \{D, UC\}$, by taking as given the market price, P_2, and by learning and incorporating the implication of the market price for the true value of the asset via Equation (5.2). Then, the implied market-clearing condition pins down $\hat{P}_2^0$ and $\hat{P}_2^1$.

[22] If λ was endogenized in a more micro-founded model via, for example, Bayesian learning, it would be affected by other model parameters, notably by the level of noise, b, in the hedge fund's demand, as well as the underlying uncertainty regarding the upcoming monetary policy shock that we left unmodeled. For simplicity, we take λ as exogenous and leave endogenizing it for future work. As will be apparent shortly, our current simple model already leads to intuitive and easy-to-interpret outcomes once we view λ, in a reduced-form way, as capturing the severity of asymmetric information that dealers and uninformed clients face on the day of a monetary policy announcement.

5.3 Equilibrium Characterisation

We characterize the equilibrium in two steps by using a backward induction. At the first step, we pin down the equilibrium objects at $t = 2$ for an arbitrary collection of "endowments," D_1^i for $i \in \{HF, D, UC\}$. In the second step, we determine the equilibrium objects at $t = 1$, including D_1^i for $i \in \{HF, D, UC\}$, by allowing agents to anticipate the equilibrium strategies that will prevail at $t = 2$.

We start with the problem of small, price-taking agents at $t = 2$. Given P_2 and the inferred D_2^{HF}, agent i's optimal post-trade holding at $t = 2$, $D_2^i\left(D_1^i\right)$, solves

$$\max_{D_2^i} \mathbb{E}\left[D_2^i \tilde{v} - \left(D_2^i - D_1^i\right) P_2 - \frac{\gamma_i}{2}\left(D_2^i\right)^2 \mid D_2^{HF}\right],$$

subject to (5.2) for $i \in \{D, UC\}$. Then, the FOC implies that the solution for $i \in \{D, UC\}$,

$$D_2^i\left(D_1^i\right) = \frac{v + \lambda D_2^{HF} - P_2}{\gamma_i},$$

is actually independent of D_1^i, which implies the lack of endowment effects—a standard result for price-taking agents with linear-quadratic utility. The hedge fund is, however, a large, price-making agent. Hence, the hedge fund makes her (noisy) choice of D_2^{HF} by keeping in mind that her choice will have a material impact on the market price P_2. This means that the hedge fund uses the following market-clearing condition

$$D_2^{HF} + \sum_{i \in \{D, UC\}} \frac{v + \lambda D_2^{HF} - P_2}{\gamma_i} = z$$

to figure out her price impact $\frac{\partial P_2}{\partial D_2^{HF}}$. Using the standard linear price impact assumption, $P_2 \equiv \hat{P}_2^0 + \hat{P}_2^1 D_2^{HF}$, the market-clearing condition becomes

$$D_2^{HF} + \sum_{i \in \{D, UC\}} \frac{v - \hat{P}_2^0 + \left(\lambda - \hat{P}_2^1\right) D_2^{HF}}{\gamma_i} = z.$$

Because this condition must hold for any D_2^{HF}, the implied pricing coefficients are

$$\hat{P}_2^0 = v - \bar{\gamma} z \text{ and } \hat{P}_2^1 = \bar{\gamma} + \lambda, \tag{5.3}$$

where $\bar{\gamma} \equiv \left(\frac{1}{\gamma_D} + \frac{1}{\gamma_{UC}}\right)^{-1}$ is the harmonic sum of the dealers' and the uninformed clients' inventory cost parameters. This implies that the hedge fund's price impact per share held is $\frac{\partial P_2}{\partial D_2^{HF}} = \hat{P}_2^1 = \bar{\gamma} + \lambda$: if the small players are more averse to inventory holding or if they face a more severe information asymmetry, the hedge fund has a larger impact on the price.

Given (5.3), the hedge fund's problem is to choose $\mu\left(\tilde{v}, D_1^{HF}\right)$ that solves

$$\max_{\mu} \mathbb{E}\left[\left(\mu+\tilde{\epsilon}\right)\tilde{v}-\left(\mu+\tilde{\epsilon}-D_1^{HF}\right)\left\{\hat{P}_2^0+\hat{P}_2^1\left(\mu+\tilde{\epsilon}\right)\right\} \mid \tilde{v}\right]. \tag{5.4}$$

Then, the FOC implies

$$\mu\left(\tilde{v}, D_1^{HF}\right)=\frac{D_1^{HF}}{2}+\frac{\tilde{v}-v+\bar{\gamma}z}{2\left(\bar{\gamma}+\lambda\right)}, \tag{5.5}$$

and in turn, $D_2^{HF}\left(\tilde{v}, D_1^{HF}\right) \sim \mathcal{N}\left(\frac{D_1^{HF}}{2}+\frac{\tilde{v}-v+\bar{\gamma}z}{2(\bar{\gamma}+\lambda)}, b^2\right)$. If the hedge fund brings more shares from the first trading round or if the asset's privately observed value is larger, the hedge fund is likely to end up with a larger post-trade holding at $t=2$. The first term on the RHS of (5.5) is the familiar endowment effect term that arises in the linear price impact models. Being endowed with more shares from earlier trading rounds effectively reduces the marginal cost of holding more shares in the current round, which feeds positively back to the optimal post-trade asset demand of a large player.[23]

Then, the equilibrium price and the equilibrium post-trade holding of small players are

$$P_2\left(\tilde{v}, D_1^{HF}\right) \sim \mathcal{N}\left(\frac{\tilde{v}+v-\bar{\gamma}z+\left(\bar{\gamma}+\lambda\right)D_1^{HF}}{2}, \left(\bar{\gamma}+\lambda\right)^2 b^2\right) \tag{5.6}$$

and

$$D_2^i\left(\tilde{v}, D_1^{HF}\right) \sim \mathcal{N}\left(\frac{\bar{\gamma}}{\gamma_i}\left[-\frac{D_1^{HF}}{2}+\frac{v-\tilde{v}+\left(\bar{\gamma}+2\lambda\right)z}{2\left(\bar{\gamma}+\lambda\right)}\right], \frac{\bar{\gamma}^2}{\gamma_i^2}b^2\right), \tag{5.7}$$

for $i \in \{D, UC\}$, respectively. In the first trading round, which is at $t=1$, agents will make their decisions by anticipating (5.5), (5.6), and (5.7).

Now we are ready to move to the next step in our backward induction. As in the previous round, we start with the problem of price-taking agents and the resulting market-clearing condition. Then, the hedge fund, the price-making agent of our model, figures out her price impact and makes her decisions accordingly. Given P_1 and the inferred D_1^{HF}, agent i's optimal post-trade holding at $t=1$, D_1^i, solves

$$\begin{aligned}\max_{D_1^i} \mathbb{E}\Big[&D_2^i\left(\tilde{v}, D_1^{HF}\right)\tilde{v}-\left\{D_2^i\left(\tilde{v}, D_1^{HF}\right)-D_1^i\right\}P_2\left(\tilde{v}, D_1^{HF}\right)\\ &-\left(D_1^i-\mathbb{I}_{\{i=D\}}z\right)P_1-\frac{\gamma_i}{2}\left(D_1^i\right)^2-\frac{\gamma_i}{2}\left\{D_2^i\left(\tilde{v}, D_1^{HF}\right)\right\}^2\Big],\end{aligned}$$

[23] More precisely, that stems from the *total* price impact term which obtains when one takes the derivative of (5.4) with respect to the last μ in the application of the chain rule: $-\left(\mu+\tilde{\epsilon}-D_1^{HF}\right)\hat{P}_2^1$.

for $i \in \{D, UC\}$. The FOC for this problem is

$$D_1^i = \frac{\mathbb{E}\left[P_2\left(\tilde{v}, D_1^{HF}\right)\right] - P_1}{\gamma_i}. \tag{5.8}$$

This FOC implies that dealers and uninformed clients would carry different shares of the asset to the second round only if $\gamma_D \neq \gamma_{UC}$. That dealers are endowed with z shares and uninformed clients 0 at the beginning of trade at $t = 1$ has nothing to do with their optimal asset demand—again, thanks to the lack of endowment effect for price-taking agents with linear-quadratic utility. Substituting (5.6) into (5.8),

$$D_1^i = \frac{v - P_1}{\gamma_i} + \frac{(\bar{\gamma} + \lambda)\, D_1^{HF} - \bar{\gamma} z}{2\gamma_i}$$

for $i \in \{D, UC\}$. This demand reveals an interesting feedback from the hedge fund's to the small players' actions at $t = 1$. If the hedge fund brings more shares of the asset to the second round, the small players anticipate that the hedge fund will have a larger post-trade holding at $t = 2$ because of her endowment effect, and in turn, a larger total upside price impact at $t = 2$. Then, through their optimality condition (5.8), the small players decide to bring more shares to $t = 2$ because of the increased expected market price of the asset at $t = 2$. The hedge fund, of course, will internalize this feedback inside her own trading decision at $t = 1$ by taking as given the following market-clearing condition:

$$D_1^{HF} + \sum_{i \in \{D, UC\}} \left\{ \frac{v - P_1}{\gamma_i} + \frac{(\bar{\gamma} + \lambda)\, D_1^{HF} - \bar{\gamma} z}{2\gamma_i} \right\} = z,$$

or equivalently,

$$D_1^{HF} + \frac{v - P_1}{\bar{\gamma}} + \frac{(\bar{\gamma} + \lambda)\, D_1^{HF} - \bar{\gamma} z}{2\bar{\gamma}} = z.$$

Because this must hold for any D_1^{HF}, the equilibrium pricing function is $P_1 \equiv \hat{P}_1^0 + \hat{P}_1^1 D_1^{HF}$ with

$$\hat{P}_1^0 = v - \frac{3}{2}\bar{\gamma} z \;\text{ and }\; \hat{P}_1^1 = \frac{3\bar{\gamma} + \lambda}{2}, \tag{5.9}$$

which implies that the hedge fund's price impact per share held at $t = 1$ is $\frac{\partial P_1}{\partial D_1^{HF}} = \hat{P}_1^1 = \frac{3\bar{\gamma}+\lambda}{2}$.

Given (5.3) and (5.9), the hedge fund chooses D_1^{HF} that solves

$$\max_{D_1^{HF}} \mathbb{E}\left[\left(\mu\left(\tilde{v}, D_1^{HF}\right) + \tilde{\epsilon}\right)\tilde{v} - D_1^{HF}\left\{\hat{P}_1^0 + \hat{P}_1^1 D_1^{HF}\right\} - \left(\mu\left(\tilde{v}, D_1^{HF}\right) + \tilde{\epsilon} - D_1^{HF}\right)\left\{\hat{P}_2^0 + \hat{P}_2^1\left(\mu\left(\tilde{v}, D_1^{HF}\right) + \tilde{\epsilon}\right)\right\}\right].$$

Using (5.5) and (5.6) and after algebra, the FOC of the hedge fund's problem is

$$D_1^{HF} = \frac{v - \frac{\bar{\gamma} z}{2} - \left\{ \hat{P}_1^0 + \hat{P}_1^1 D_1^{HF} \right\}}{\bar{\gamma}},$$

which, in turn, implies that the hedge fund's equilibrium post-trade holding at $t = 1$ is

$$D_1^{HF} = \frac{2\bar{\gamma}}{5\bar{\gamma} + \lambda} z. \tag{5.10}$$

Hence, the equilibrium price and the equilibrium post-trade holding of small players are

$$P_1 = v - \frac{9\bar{\gamma} + \lambda}{10\bar{\gamma} + 2\lambda} \bar{\gamma} z \tag{5.11}$$

and

$$D_1^i = \frac{\bar{\gamma}}{\gamma_i} \frac{3\bar{\gamma} + \lambda}{5\bar{\gamma} + \lambda} z \tag{5.12}$$

for $i \in \{D, UC\}$, respectively.

Taking stock, we summarize the agents' trading behavior on the equilibrium path in Proposition 1 (with the proof presented in Section A.4 of the Appendix).

Proposition 1 *On the equilibrium path, the agents' signed trade volumes and the market-clearing prices are as follows:*

$$q_1^{HF} = \frac{2\bar{\gamma}}{5\bar{\gamma} + \lambda} z, \;\; q_1^D = \left(\frac{\gamma_{UC}}{\gamma_D + \gamma_{UC}} \frac{3\bar{\gamma} + \lambda}{5\bar{\gamma} + \lambda} - 1 \right) z, \;\; q_1^{UC} = \frac{\gamma_D}{\gamma_D + \gamma_{UC}} \frac{3\bar{\gamma} + \lambda}{5\bar{\gamma} + \lambda} z, \tag{5.13}$$

and

$$P_1 = v - \frac{9\bar{\gamma} + \lambda}{10\bar{\gamma} + 2\lambda} \bar{\gamma} z$$

at $t = 1$ and

$$q_2^{HF}(\tilde{v}) \sim \mathcal{N}\left(\frac{\tilde{v} - v}{2(\bar{\gamma} + \lambda)} + \frac{\bar{\gamma} z}{2(\bar{\gamma} + \lambda)} \frac{3\bar{\gamma} - \lambda}{5\bar{\gamma} + \lambda}, b^2 \right),$$

$$q_2^D(\tilde{v}) \sim \mathcal{N}\left(\frac{\gamma_{UC}}{\gamma_D + \gamma_{UC}} \left[\frac{v - \tilde{v}}{2(\bar{\gamma} + \lambda)} - \frac{\bar{\gamma} z}{2(\bar{\gamma} + \lambda)} \frac{3\bar{\gamma} - \lambda}{5\bar{\gamma} + \lambda} \right], \left(\frac{\gamma_{UC}}{\gamma_D + \gamma_{UC}} \right)^2 b^2 \right),$$

$$q_2^{UC}(\tilde{v}) \sim \mathcal{N}\left(\frac{\gamma_D}{\gamma_D + \gamma_{UC}} \left[\frac{v - \tilde{v}}{2(\bar{\gamma} + \lambda)} - \frac{\bar{\gamma} z}{2(\bar{\gamma} + \lambda)} \frac{3\bar{\gamma} - \lambda}{5\bar{\gamma} + \lambda} \right], \left(\frac{\gamma_D}{\gamma_D + \gamma_{UC}} \right)^2 b^2 \right),$$

and

$$P_2(\tilde{v}) \sim \mathcal{N}\left(\frac{\tilde{v} + v}{2} - \frac{3\bar{\gamma} - \lambda}{10\bar{\gamma} + 2\lambda} \bar{\gamma} z, (\bar{\gamma} + \lambda)^2 b^2 \right)$$

at $t = 2$.

The first type of implications of Proposition 1 we discuss are on liquidity provision in the secondary market following a bond issuance. Dealers arrive at the market at $t = 1$ with a large inventory they have obtained in the primary issuance. Thus, dealers are natural sellers and uninformed clients and the hedge fund are natural buyers at $t = 1$. Looking at (5.13), one can see that the hedge fund's liquidity provision increases with $\bar{\gamma}$ and decreases with λ. Naturally, if the marginal inventory holding cost of small players ($\bar{\gamma}$) is larger, the hedge fund who does not have any inventory cost steps in more as the gains from trade implies. If the anticipated information asymmetry for the upcoming monetary policy shock at $t = 2$ (higher λ) is more severe, however, the hedge fund cuts down her liquidity provision. Indeed, a higher λ implies a larger price impact for the hedge fund, but unlike a larger $\bar{\gamma}$, does not increase the gains from her trade with dealers. Thus, the hedge fund provides less liquidity when λ is larger. One can also see from the formula for q_1^{UC} that uninformed clients partially compensates the lost liquidity provision from the hedge fund, as q_1^{UC} is an increasing function of λ.

Next, we discuss the implications of Proposition 1 for the price drift before monetary policy announcements. Our normalized benchmark price is $P_0 = v$, which we interpret as the asset's consensus fundamental value before any issuance. Indeed, when the supply is 0, the quantity of risk is 0 as well, implying no risk premium or no compensation for inventory costs. Then, the implied drift is

$$P_1 - P_0 = -\frac{9\bar{\gamma} + \lambda}{10\bar{\gamma} + 2\lambda}\bar{\gamma}z = -\left(1 + \frac{4\bar{\gamma}}{5\bar{\gamma} + \lambda}\right)\frac{\bar{\gamma}z}{2}. \tag{5.14}$$

The following corollary highlights important properties of this price drift.

Corollary 2 *(i)* $P_1 - P_0 < 0$, *(ii)* $\frac{\partial|P_1-P_0|}{\partial z} > 0$, *(iii)* $\frac{\partial|P_1-P_0|}{\partial\bar{\gamma}} > 0$, *and (iv)* $\frac{\partial|P_1-P_0|}{\partial\lambda} < 0$.

In terms of the terminology used in our empirical analysis, the Corollary implies that (i) bond yields rise after issuance, (ii) the rise is larger after a large issuance, (iii) the rise is larger if the market's inventory holding capacity is smaller, and (iv) the rise is smaller if the MPC-related information asymmetry is larger. Perhaps the last implication (iv) sounds surprising at the first glance. However, it is the natural consequence of the hedge fund refraining from liquidity provision. As can be seen from (5.13), as λ gets larger the quantity demanded by the hedge fund gets smaller and the quantity demanded by small players get larger. The marginal cost of holding the asset, in addition to its market price, is $\bar{\gamma}D$ for the representative small player and $\hat{P}_1^1 D = \frac{3\bar{\gamma}+\lambda}{2}D$ for the hedge fund. Therefore, the market's marginal valuation for the asset at $t = 1$ in an equilibrium in which the hedge fund provides less liquidity is larger, which implies a larger equilibrium price and a smaller magnitude for the drift.

Interpreting Our Empirical Findings We view the post-issuance, pre-MPC announcement period as an event window that leads to an increase in both $\bar{\gamma}$ and λ in our model. That is, under the heightened uncertainty about future interest rates, dealers and/or uninformed clients face larger inventory costs, and also larger information asymmetry because this is a period when speculative traders have stronger incentive to acquire information. With two parameters changing at the same time, one may argue that our model has a large degree of freedom but it is important to keep in mind that we have two sets of empirical regularities, one set of aggregate results on yield and another set of more granular results on agent-specific trading behavior. Thus, although our theoretical model has two free parameters to speak to the pre-MPC window, the set of our empirical findings is rich enough to discipline our theory.[24]

First, considering panel (b) of Table 2, during a pre-MPC window, the term inside the price drift (5.14) $\left(1+\frac{4\bar{\gamma}}{5\bar{\gamma}+\lambda}\right)\bar{\gamma}$ must be larger during a pre-MPC window compared to post-issuance times without MPC announcements. That is, let $\bar{\gamma}_A$ and λ_A denote the parameters associated with times outside pre-MPC window, and $\bar{\gamma}_B$ and λ_B with pre-MPC windows. Then,

$$\left(1+\frac{4\bar{\gamma}_B}{5\bar{\gamma}_B+\lambda_B}\right)\bar{\gamma}_B > \left(1+\frac{4\bar{\gamma}_A}{5\bar{\gamma}_A+\lambda_A}\right)\bar{\gamma}_A.$$

An increase in λ makes the fraction $\frac{4\bar{\gamma}}{5\bar{\gamma}+\lambda}$ smaller. Thus, for the inequality to hold, it is necessarily the case that $\bar{\gamma}_B > \bar{\gamma}_A$. That is, if $\lambda_B > \lambda_A$, we could not rationalize the large price drift during pre-MPC windows if dealers' and uninformed clients' inventory costs both stayed the same. As a result, through the lens of our model, we view the increased inventory costs during pre-MPC windows as the main reason behind the pre-MPC price drift.

Second, considering Table 5, the hedge fund's share in liquidity provision must be lower during a pre-MPC window compare to times outside pre-MPC windows, which means the fraction $\frac{2\bar{\gamma}}{5\bar{\gamma}+\lambda}$ must be lower during a pre-MPC window according to (5.13). Then,

$$\frac{2\bar{\gamma}_B}{5\bar{\gamma}_B+\lambda_B} < \frac{2\bar{\gamma}_A}{5\bar{\gamma}_A+\lambda_A}. \tag{5.15}$$

Because we need $\bar{\gamma}_B > \bar{\gamma}_A$ to make sense of the price drift, the inequality (5.15) can be simultaneously satisfied only if $\frac{\bar{\gamma}_B}{\bar{\gamma}_A} < \frac{\lambda_B}{\lambda_A}$. The intuition behind this inequality is as follows. During the pre-MPC window, dealers' inventory costs are larger implying larger gains from trade between dealers and hedge funds, ceteris paribus. But if this was the entire story, hedge funds would provide more liquidity during pre-MPC windows. Thus, it must be the case that information asymmetry problem becomes even more severe than inventory costs during pre-MPC windows so that hedge funds refrain from liquidity provision as a way to mitigate their price impact. Indeed,

[24] Most of the empirical literature relies only on aggregate datasets on yields or prices and does not analyze transaction-level data. Thus, their analyses lack the dimension of who provides liquidity and when.

as our model highlights, if dealers and uninformed clients face worse information asymmetry problem, the hedge fund faces a larger marginal cost of liquidity provision because of her increased price impact per share held.

Finally, a natural question is what generates the increase in the composite inventory cost parameter, $\bar{\gamma}$, during pre-MPC windows. It can be an increase in the dealers' inventory costs, γ_D, or an increase in the uninformed clients' inventory costs, γ_{UC}, or even a sufficiently high increase in one of those parameters while the other one slightly declines. To shed light on this question, we use the empirical fact that the dealer sector sells significantly more to the client sector in pre-MPC windows compared to other issuance periods. Thus, maintaining our convention that B refers to pre-MPC windows and A to other issuance periods, (5.13) implies that

$$\left(\frac{\gamma_{UC,A}}{\gamma_{D,A}+\gamma_{UC,A}}\frac{3\bar{\gamma}_A+\lambda_A}{5\bar{\gamma}_A+\lambda_A}-1\right)z > \left(\frac{\gamma_{UC,B}}{\gamma_{D,B}+\gamma_{UC,B}}\frac{3\bar{\gamma}_B+\lambda_B}{5\bar{\gamma}_B+\lambda_B}-1\right)z,$$

or equivalently,

$$\frac{1}{1+\frac{\gamma_{D,A}}{\gamma_{UC,A}}}\frac{3\bar{\gamma}_A+\lambda_A}{5\bar{\gamma}_A+\lambda_A} > \frac{1}{1+\frac{\gamma_{D,B}}{\gamma_{UC,B}}}\frac{3\bar{\gamma}_B+\lambda_B}{5\bar{\gamma}_B+\lambda_B}. \tag{5.16}$$

Because we need $\frac{3\bar{\gamma}_A+\lambda_A}{5\bar{\gamma}_A+\lambda_A} < \frac{3\bar{\gamma}_B+\lambda_B}{5\bar{\gamma}_B+\lambda_B}$ to make the hedge fund refrain from liquidity provision during pre-MPC windows as explained above, the inequality (5.16) can be satisfied only if $\frac{\gamma_{D,B}}{\gamma_{UC,B}} \gg \frac{\gamma_{D,A}}{\gamma_{UC,A}}$. Hence, the main reason why $\bar{\gamma}$ is larger during pre-MPC windows is the dealers' heightened inventory costs. Our theory implies that there is something special about pre-MPC windows that makes dealers more inventory averse relative to uninformed clients as well as informed clients such as hedge funds. As a result, dealers sell more to the client sector during pre-MPC windows relative to their selling volume outside pre-MPC windows.[25]

6 Conclusion

A rapidly expanding literature in macroeconomics has studied the role of monetary policy announcements and government bond supply in affecting long-term interest rates. A main message of our paper is that these two factors do not operate in a vacuum, and the interaction of these two factors can generate a sizeable impact on interest rates as well as on bond market liquidity (even before the announcement takes place). In light of our empirical evidence, an interesting question for future research is to determine the socially optimal way of timing bond issuances around monetary policy announcements.

[25]Note that, to the extent that MPC announcements capture high-volatility periods, our theoretical results is reminiscent of Brunnermeier and Pedersen (2009), which shows that tighter balance sheet constraints on dealers reduces the liquidity of high-volatility assets compared to low-volatility assets. Related empirical evidence (Comerton-Forde, Hendershott, Jones, Moulton, and Seasholes, 2010) corroborated this relation between volatility, liquidity and dealers' inventory constraints.

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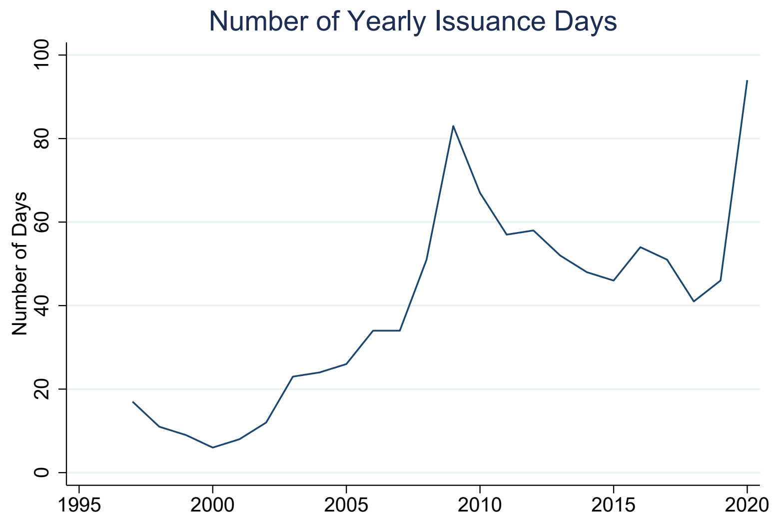
Figures and Tables

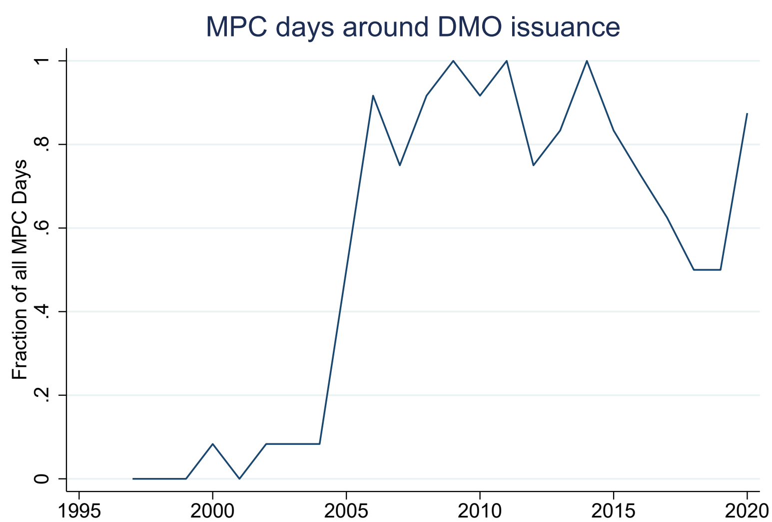
6.1 Aggregate Evidence

Figure 1: MPC Days and Issuance Days over Time: 1997-2020

(a) Trading Days with Bond Issuance



(b) Fraction of MPC Days with Preceding Issuance Days



Notes: Panel A of this figure shows the total number days (in a given year) on which new nominal or inflation-linked government debt was issued. Panel B shows the fraction of pre-MPC windows (in a given year) that coincided with new government bond issuance. Pre-MPC windows are defined as trading days that are either one or two days before days of MPC announcements.

Table 1: Summary Statistics

(a) Issued Amount at Primary Issuances

		(1)	(2)	(3)	(4)	(5)	(6)
Issued Amount ($m)	Time period	Mean	Std. Dev.	25th	50th	75th	N
Nominal Bonds	1997m5-2021m7	2968.97	1141.15	2250	2750	3600	730
	1997m5-2007m12	2463.48	430.01	2250	2500	2750	112
	2008m1-2021m7	3060.58	1204.39	2250	3000	3750	618
Inflation-Linked	1997m5-2021m7	1150.16	1006.68	575	925	1245	345
	1997m5-2007m12	552.37	336.12	350	450	800	99
	2008m1-2021m7	1390.73	1084.06	812	1005	1400	246

(b) Years to Maturity

	(1)	(2)	(3)	(4)	(5)	(6)
Bond Type	Mean	Std. Dev.	25th	50th	75th	N
Nominal	16.98	13.36	5.54	10.33	29.15	730
Inflation-Linked	24.11	12.20	13.57	22.72	30.94	345

(c) Daily Changes in Nominal Bond Yields

	(1)	(2)	(3)	(4)	(5)	(6)
Maturity	Mean	Std. Dev.	25th	50th	75th	N
5 years	-0.111	4.637	-2.854	-0.151	2.520	6128
10 years	-0.109	4.842	-3.041	-0.135	2.68	6128
15 years	-0.108	4.611	-2.898	-0.165	2.572	6128
20 years	-0.107	4.490	-2.713	-0.106	2.439	6128

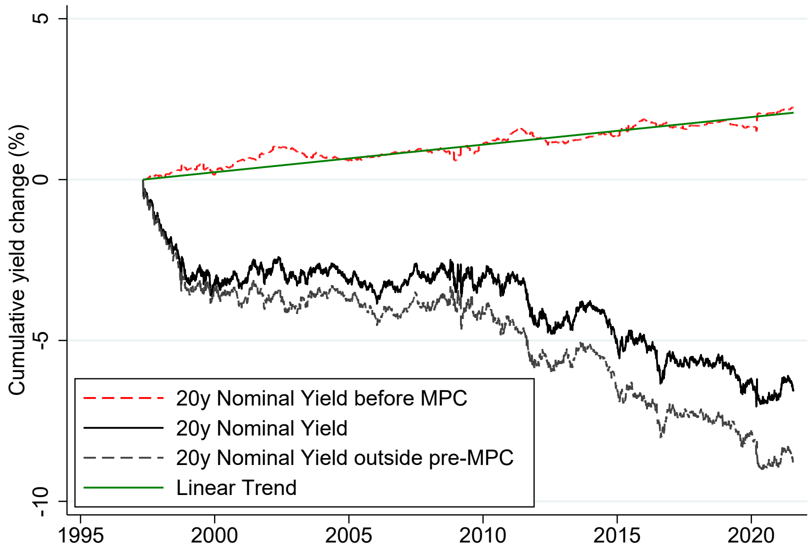
Note: Panel A reports summary statistics of UK government bond issuances, distinguishing between nominal and inflation-linked debt issuances. The statistics are computed for the whole sample (1997m5-2021m7) as well as for two subperiods. Panel B reports summary statistics on the maturity of issued debt using the whole sample. Panel C reports summary statistics of daily nominal yield changes (expressed in basis points) for four different maturities, using the whole sample.

Table 2: Yield Changes before MPC Meetings: the Role of Bond Issuance

	$\Delta 5y$ yield	$\Delta 10y$ yield	$\Delta 15y$ yield	$\Delta 20y$ yield
	(1)	(2)	(3)	(4)
(A) Yield Changes before MPC Meetings				
pre-MPC window	0.28	0.45**	0.50**	0.51***
	(1.42)	(2.20)	(2.51)	(2.58)
Constant	-0.14**	-0.15**	-0.15**	-0.15**
	(-2.18)	(-2.30)	(-2.46)	(-2.52)
N	6128	6128	6128	6128
(B) Yield Changes before MPC Meetings and during Bond Issuance				
Pre-MPC window # Issuance	0.20	0.54*	0.65**	0.68**
	(0.73)	(1.91)	(2.39)	(2.53)
Pre-MPC window # No issuance	0.46	0.41	0.37	0.36
	(1.63)	(1.44)	(1.36)	(1.29)
Outside MPC window # Issuance	0.23	0.20	0.19	0.17
	(1.32)	(1.10)	(1.07)	(1.01)
Constant	-0.17**	-0.18**	-0.18***	-0.18***
	(-2.50)	(-2.55)	(-2.69)	(-2.72)
N	6128	6128	6128	6128
(C) Yield Changes before MPC Meetings and during Large Bond Issuance				
Pre-MPC window # Large issuance	0.42	0.86**	1.01***	1.05***
	(1.09)	(2.15)	(2.58)	(2.71)
Pre-MPC window # No Large issuance	0.25	0.31	0.31	0.30
	(1.09)	(1.32)	(1.38)	(1.35)
Outside MPC window # Large issuance	0.10	-0.09	-0.22	-0.29
	(0.42)	(-0.38)	(-0.93)	(-1.29)
Constant	-0.14**	-0.14**	-0.14**	-0.13**
	(-2.20)	(-2.11)	(-2.12)	(-2.09)
N	6128	6128	6128	6128

Note: Panel A of this table regresses daily changes in the 5-year, 10-year, 15-year and 20-year yields on UK nominal government bonds on an indicator variable that takes value one for days that are either one or two days before MPC days. Panel B regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new (nominal or inflation-linked) bond issuance, (ii) pre-MPC windows without new bond issuance and (iii) all trading days with issuance and without MPC meetings. Panel C regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new large (nominal or inflation-linked) bond issuance (i.e. issuance larger than the median issuance in the given year), (ii) pre-MPC windows without new large bond issuance and (iii) all trading days with large issuances and without MPC meetings. All regressions include a constant. The estimation period covers 1997m5-2021m7 and 270 MPC announcement windows.

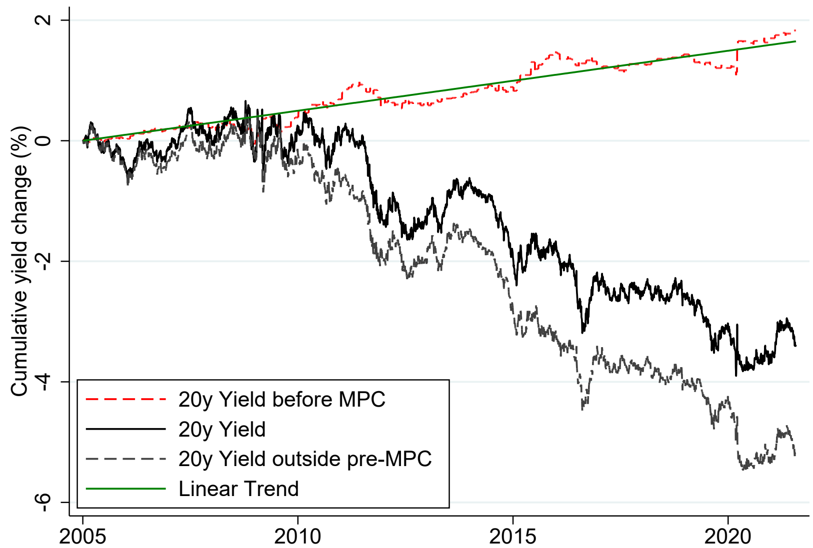
Figure 2: A Decomposition of Long-term Gilt Yields: 1997m5-2021m6



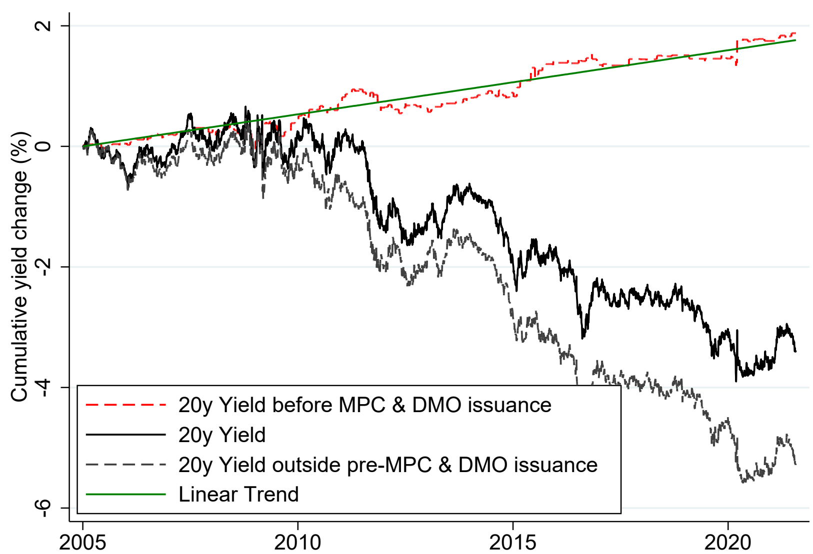
Note: this figure documents that 20-year UK nominal bond yields tend to rise in the 2-day window before MPC meetings. This 2-day window includes for every MPC meeting the day prior to the meeting, and the day that is two days before the meeting. The black line shows the actual evolution of the 20-year yield. The red line shows a hypothetical time series that is constructed by taking into account only the yield changes that were realised in the 2-day window before MPC meetings; the yield changes that occurred on all days outside of this window are set to zero. The green line is an estimated linear trend associated with the red line. The gray line shows a hypothetical time series that is constructed by taking into account only the yield changes that were realised outside the 2-day window before MPC meetings. The analysis includes all 273 MPC meetings from May 1997 to June 2021.

Figure 3: A Decomposition of Long-term Gilt Yields: 2005m1-2021m6

(a) The Role of pre-MPC Windows



(b) The Role of pre-MPC Windows with Bond Issuances



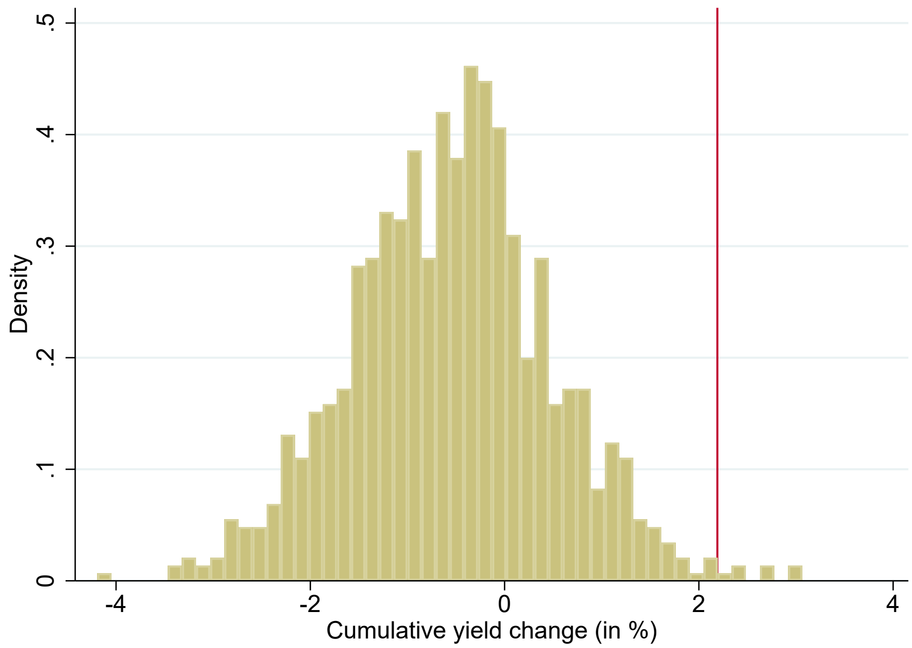
Note: Panel A of this figure documents that 20-year UK nominal bond yields tend to rise in the 2-day window before MPC meetings. This 2-day window includes for every MPC meeting the day prior to the meeting, and the day that is two days before the meeting. The black line shows the actual evolution of the 20-year yield. The red line shows a hypothetical time series that is constructed by taking into account only the yield changes that were realised in the 2-day window before MPC meetings; the yield changes that occurred on all days outside of this window are set to zero. The green line is an estimated linear trend associated with the red line. The gray line shows a hypothetical time series that is constructed by taking into account only the yield changes that were realised outside the 2-day window before MPC meetings. In Panel B, The red line shows a hypothetical time series that is constructed by taking into account only the yield changes that were realised in those 2-day windows before MPC meetings that coincided with new issuances of nominal of inflation-linked government debt; the yield changes that occurred on all days outside of this window are set to zero. Similarly, The gray line shows a hypothetical time series that is constructed by taking into account only the yield changes that were realised outside the 2-day window before MPC meetings with new issuances. The analysis includes all 181 MPC meetings from Jan 2005 to June 2021.

Table 3: 10Y Yield Changes before MPC Meetings: Term Premium vs Expectations

(A) 10Y Yield Changes before MPC Meetings				
	Yield	Fitted yield	Term pr.	Expect.
	(1)	(2)	(3)	(4)
pre-MPC window	0.45**	0.45**	0.38***	0.07
	(2.14)	(2.13)	(2.62)	(0.52)
Constant	-0.16**	-0.16**	-0.09*	-0.07*
	(-2.41)	(-2.41)	(-1.92)	(-1.73)
N	5983	5983	5983	5983
(B) 10Y Yield Changes before MPC Meetings and during Bond Issuance				
Pre-MPC window # Issuance	0.54*	0.54*	0.61***	-0.08
	(1.87)	(1.85)	(3.10)	(-0.43)
Pre-MPC window # No issuance	0.42	0.42	0.12	0.30
	(1.45)	(1.45)	(0.60)	(1.52)
Outside MPC window # Issuance	0.25	0.25	0.08	0.17
	(1.33)	(1.31)	(0.59)	(1.42)
Constant	-0.20***	-0.20***	-0.10**	-0.10**
	(-2.75)	(-2.74)	(-2.04)	(-2.14)
N	5983	5983	5983	5983
(C) 10Y Yield Changes before MPC Meetings and during Large Bond Issuance				
Pre-MPC window # Large issuance	0.86**	0.85**	0.87***	-0.02
	(2.06)	(2.04)	(2.91)	(-0.07)
Pre-MPC window # No Large issuance	0.31	0.31	0.19	0.12
	(1.32)	(1.32)	(1.23)	(0.78)
Outside MPC window # Large issuance	-0.05	-0.05	-0.26	0.21
	(-0.20)	(-0.19)	(-1.37)	(1.23)
Constant	-0.16**	-0.16**	-0.07	-0.09**
	(-2.27)	(-2.28)	(-1.48)	(-2.00)
N	5983	5983	5983	5983

Note: this table regresses daily changes in the 10-year yield on UK nominal government bonds and fitted yields, term premia and expectations components from a dynamic no-arbitrage affine term structure model, estimated by linear regression techniques (Adrian, Crump, and Moench, 2013; Malik and Meldrum, 2016) on a sample covering 1991m1-2020m12. The regressor in Panel A is an indicator variable that takes value one for days that are either one or two days before MPC days. The regressors in Panel B are indicator variables capturing (i) pre-MPC windows with new (nominal or inflation-linked) bond issuance, (ii) pre-MPC windows without new bond issuance and (iii) all trading days with issuance and without MPC meetings. The regressors in Panel C are indicator variables capturing (i) pre-MPC windows with new large (nominal or inflation-linked) bond issuance (i.e. issuance larger than the median issuance in the given year), (ii) pre-MPC windows without new large bond issuance and (iii) all trading days with large issuances and without MPC meetings. All regressions include a constant.

Figure 4: Placebo Test – Random MPC Meetings



Note: this histogram plots cumulative changes in 20-year yields that are realised in a 2-day window before placebo MPC meetings, based on 1000 simulated paths of randomised meetings. The red vertical line shows the cumulative change in a 2-day window before actual MPC meetings. The sample of yield changes covers May 1997 to June 2021.

6.2 Trade-level Evidence

6.2.1 Summary of Trading Activity

Table 4: Composition of Orderflow on and after Issuance Days *without* MPC Decisions

	(1)	(2)	(3)	(4)	(5)	(6)
	in $millions		N		% of All Clients	
	Turnover	Orderflow	Trades	Turnover	Orderflow	Trades
All Clients	7076.85	229.76	1011.12	100%	100%	100%
Comm.Banks	484.54	-6.61	88.77	6.8%	-2.9%	8.8%
Pens&Ins.	1160.40	61.78	178.58	16.4%	26.9%	17.7%
Central Banks	820.49	81.19	27.84	11.6%	35.3%	2.8%
Other Services	579.96	13.54	94.60	8.2%	5.9%	9.4%
Hedge Funds	1693.97	-9.55	99.11	23.9%	-4.2%	9.8%
Asset Managers	2337.48	89.41	522.22	33.0%	38.9%	51.6%

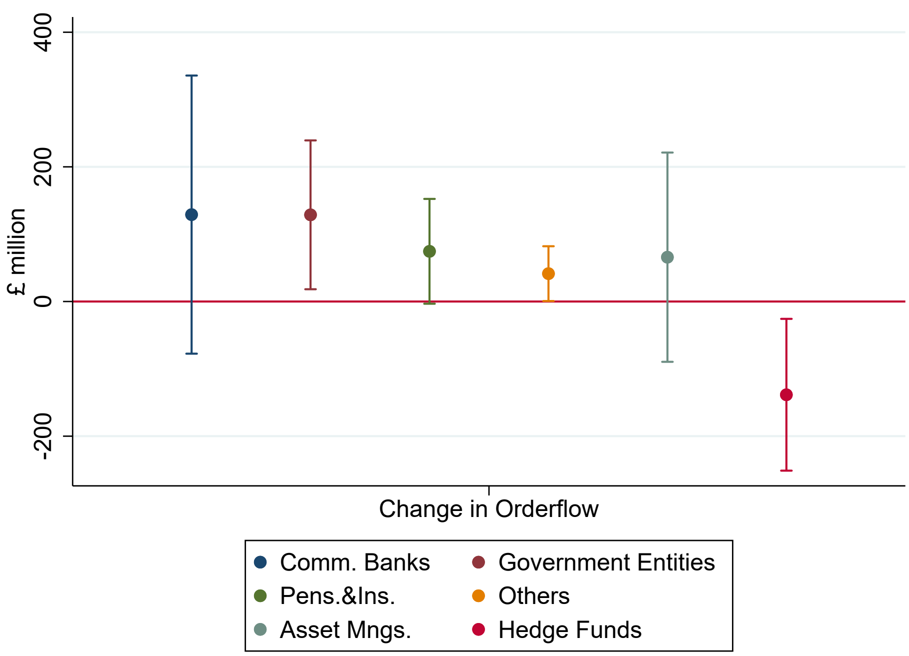
Notes: the table provides summary statistics on daily turnover, orderflow (buy volume net sell volume) and number of transactions for all clients as well as the six client sectors. The sample covers the period from Aug 2011 to December 2019.

Table 5: Composition of Orderflow after Primary Issuance Days *outside* and *during* pre-MPC Windows

Panel A: Orderflow						
	(1)	(2)	(3)	(4)	(5)	(6)
		in $millions			% of Total Client Orderflow	
	Issue#No MP	Issue#MP	Other Days	Issue#No MP	Issue#MP	Other Days
All Clients	448.03	594.26	142.23	100%	100%	100%
Comm.Banks	10.90	136.16	-20.46	2.4%	22.9%	-14.4%
Pens&Ins.	22.98	59.65	73.57	5.1%	10.0%	51.7%
Central Banks	85.92	181.31	73.75	19.2%	30.5%	51.9%
Other Services	8.47	17.60	14.81	1.9%	3.0%	10.4%
Hedge Funds	130.59	27.35	-53.88	29.1%	4.6%	-37.9%
Asset Managers	189.17	172.20	54.45	42.2%	29.0%	38.3%

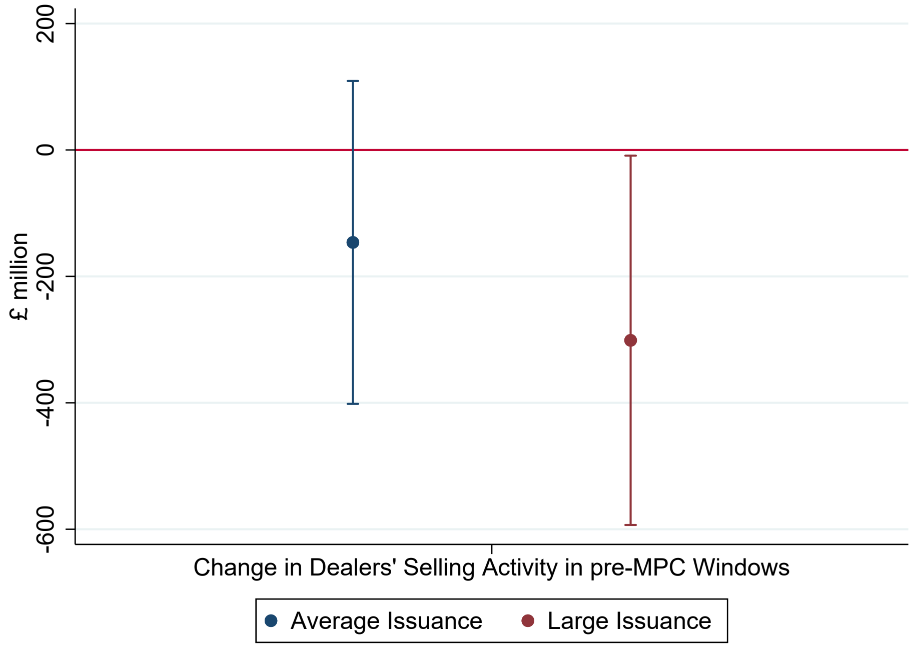
Notes: the table provides summary statistics on daily orderflow (buy volume net sell volume) for all clients as well as the six client sectors. The sample, covering the period from Aug 2011 to December 2019, includes 2015 trading days. The sample is decomposed into (i) 93 days that fall in pre-MPC windows with issuance days (Issue#MP), (ii) 465 days that are outside pre-MPC windows but on issuance day or the day after the issuance day (Issue#No MP), and (iii) the remaining 1547 days without new issuance (Other Days).

Figure 5: Change in Clients' Orderflow after Primary Issuance: Pre-MPC windows vs Regular Days



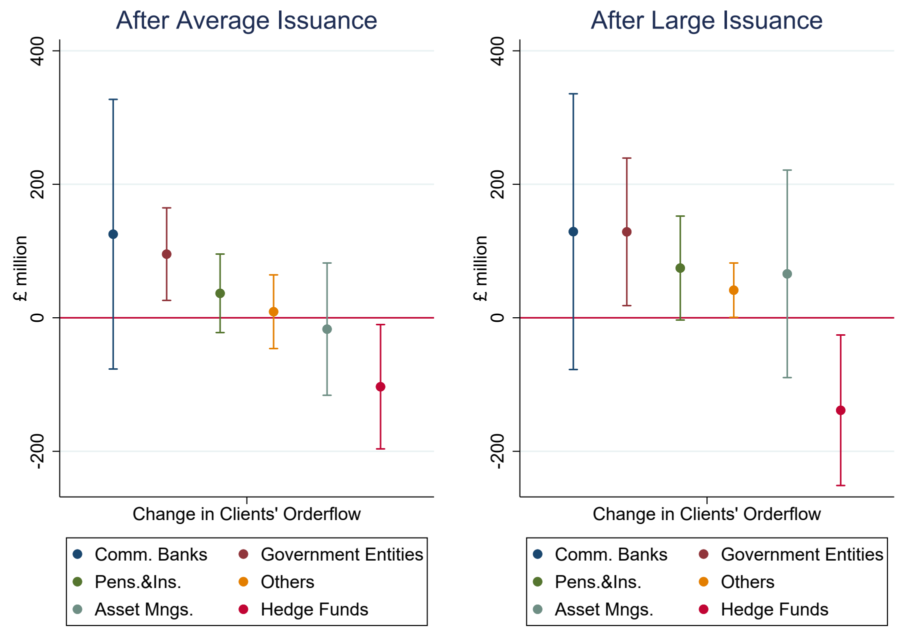
Note: this figure plots the estimated difference in orderflow (after primary issuance) of the six client sectors during and outside pre-MPC windows. The candle plots show the estimated β_i coefficient (for sector i) from the regression $Orderflow_{i,t} = c_i + \beta_i \times D_{MP,t} + \varepsilon_{i,t}$, where $D_{MP,t}$ is an indicator variable taking value one for days that are in the pre-MPC windows which coincide with primary issuances (93 days altogether); $D_{MP,t}$ takes value zero for days with issuances and days that are one day after issuances days (465 days altogether). The capped spikes denote 95% confidence bands based on robust standard errors. The trading days are from the sample covering the period from 1 Sep 2011 to 31 Dec 2019.

Figure 6: Change in Dealers' Selling Activity after Primary Issuance: Pre-MPC windows vs Regular Days



Note: this figure plots the estimated difference in dealers' selling activity (after primary issuance) during and outside pre-MPC windows. The candle plots show the estimated β_i coefficient from the regression $Orderflow_t = c + \beta \times D_{MP,t} + \varepsilon_t$, where $D_{MP,t}$ is an indicator variable taking value one for days that are in the pre-MPC windows which coincide with average primary issuances (93 days altogether), corresponding to the blue candle, and with large (i.e. above median issue in the given calendar year) primary issuances (38 day altogether), corresponding to the red candle; $D_{MP,t}$ takes value zero for days with average issuances and days that are one day after average issuances days (465 days altogether), corresponding to the blue candle, and large issuances (236 days altogether), corresponding to the red candle. The capped spikes denote 95% confidence bands based on robust standard errors. The trading days are from the sample covering the period from 1 Sep 2011 to 31 Dec 2019.

Figure 7: Change in Clients' Orderflow after Primary Issuance: Pre-MPC windows vs Regular Days



Note: this figure plots the estimated difference in orderflow (after primary issuance) of the six client sectors during and outside pre-MPC windows. The candle plots on the left panel show the estimated β_i coefficient (for sector i) from the regression $Orderflow_{i,t} = c_i + \beta_i \times D_{MP,t} + \varepsilon_{i,t}$, where $D_{MP,t}$ is an indicator variable taking value one for days that are in the pre-MPC windows which coincide with primary issuances (93 days altogether); $D_{MP,t}$ takes value zero for days with issuances and days that are one day after issuances days (465 days altogether). The candle plots on the right panel show the estimated β_i where $D_{MP,t}$ is an indicator variable taking value one for days that are in the pre-MPC windows which coincide with large (i.e. above median issue in the given calendar year) primary issuances (38 days altogether); $D_{MP,t}$ takes value zero for days with large issuances and days that are one day after large issuances days (236 days altogether). The capped spikes denote 95% confidence bands based on robust standard errors. The trading days are from the sample covering the period from 1 Sep 2011 to 31 Dec 2019.

6.2.2 Hedge Funds' Trading Performance

Table 6: Average Hedge Fund Returns (over 1-6 Day Horizons) Around Debt Issuance and Monetary Policy Decisions

	Unweighted Performance			Volume-Weighted Performance		
	$T = 1d$	$T = 3d$	$T = 6d$	$T = 1d$	$T = 3d$	$T = 6d$
	(1)	(2)	(3)	(4)	(5)	(6)
t-2	2.43	-1.06	-4.97	2.80**	-0.44	-0.66
t-1	-1.16	0.63	-0.31	-0.97	-1.12	1.24
t [MPC]	2.93*	7.68***	13.22***	2.15*	1.30	4.99*
Other Days	1.36***	1.98***	2.76***	0.71***	1.28***	2.09***

Notes: the table presents average performance (measured in basis points) of hedge fund trades over 1-, 3- and 6-day horizons (based on the measure 4.1) in pre-MPC windows that coincide with primary issuance. The rows capture the days on which the trades are executed (t denotes day of MPC meeting, $t-1$ denotes the day before MPC meetings and $t-2$ denotes the days that are two days before MPC meetings). The columns capture the horizon (T) over which the performance measure is computed. Columns 1-3 present unweighted average performance measures for the hedge funds sector and columns 4-6 present average measures that are weighted by pound values of the transactions. The stars indicate whether the returns are different from zero at 1%, 5% and 10% significance levels.

6.2.3 *Trading Performance of Dealers and Other Clients*

Table 7: Average Dealer Returns (over 1-6 Day Horizons) Around Debt Issuance and Monetary Policy Decisions

	Unweighted Performance			Volume-Weighted Performance		
	$T = 1d$	$T = 3d$	$T = 6d$	$T = 1d$	$T = 3d$	$T = 6d$
	(1)	(2)	(3)	(4)	(5)	(6)
t-2	-0.73	-1.26	-2.56	-1.02	-0.56	-1.64
t-1	-0.89	-1.97	-2.40	-0.90	-2.23*	-2.10
t [MPC]	-0.41	-1.38	-0.83	-0.87	-0.18	-0.33
Other Days	-0.27**	-1.01***	-1.38***	-0.64***	-1.26***	-1.94***

Notes: the table presents average performance (measured in basis points) of dealer trades over 1-, 3- and 6-day horizons (based on the measure 4.1) in pre-MPC windows that coincide with primary issuance. The rows capture the days on which the trades are executed (t denotes day of MPC meeting, $t-1$ denotes the day before MPC meetings and $t-2$ denotes the days that are two days before MPC meetings). The columns capture the horizon (T) over which the performance measure is computed. Columns 1-3 present unweighted average performance measures for the dealer sector and columns 4-6 present average measures that are weighted by pound values of the transactions. The stars indicate whether the returns are different from zero at 1%, 5% and 10% significance levels.

Table 8: Average (Non-HF) Client Returns (over 1-6 Day Horizons) Around Debt Issuance and Monetary Policy Decisions

	Unweighted Performance			Volume-Weighted Performance		
	$T = 1d$	$T = 3d$	$T = 6d$	$T = 1d$	$T = 3d$	$T = 6d$
	(1)	(2)	(3)	(4)	(5)	(6)
t-2	0.55	1.40	3.34	0.77	1.19	3.05
t-1	1.18	2.18	2.57	1.57	3.07*	2.29
t [MPC]	-0.15	0.40	-0.73	0.46	-0.46	-1.17
Other Days	0.16	0.95***	1.28***	0.64***	1.35***	1.88***

Notes: the table presents average performance (measured in basis points) of (non-hedge fund) clients' trades over 1-, 3- and 6-day horizons (based on the measure 4.1) in pre-MPC windows that coincide with primary issuance. The rows capture the days on which the trades are executed (t denotes day of MPC meeting, $t-1$ denotes the day before MPC meetings and $t-2$ denotes the days that are two days before MPC meetings). The columns capture the horizon (T) over which the performance measure is computed. Columns 1-3 present unweighted average performance measures for the (non-hedge fund) client sector and columns 4-6 present average measures that are weighted by pound values of the transactions. The stars indicate whether the returns are different from zero at 1%, 5% and 10% significance levels.

A Appendix

A.1 Tables

Table 9: Scheduled MPC days

year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1997	-	-	-	-	-	06-Jun	10-Jul	07-Aug	11-Sep	09-Oct	06-Nov	04-Dec
1998	08-Jan	05-Feb	05-Mar	09-Apr	07-May	04-Jun	09-Jul	06-Aug	10-Sep	08-Oct	05-Nov	10-Dec
1999	07-Jan	04-Feb	03-Mar	08-Apr	06-May	10-Jun	08-Jul	05-Aug	08-Sep	07-Oct	04-Nov	09-Dec
2000	13-Jan	10-Feb	09-Mar	06-Apr	04-May	07-Jun	06-Jul	03-Aug	07-Sep	05-Oct	09-Nov	07-Dec
2001	11-Jan	08-Feb	08-Mar	05-Apr	10-May	06-Jun	05-Jul	02-Aug	06-Sep	04-Oct	08-Nov	05-Dec
2002	10-Jan	07-Feb	07-Mar	04-Apr	09-May	06-Jun	04-Jul	01-Aug	05-Sep	10-Oct	07-Nov	05-Dec
2003	09-Jan	06-Feb	06-Mar	10-Apr	08-May	05-Jun	10-Jul	07-Aug	04-Sep	09-Oct	06-Nov	04-Dec
2004	08-Jan	05-Feb	04-Mar	08-Apr	06-May	10-Jun	08-Jul	05-Aug	09-Sep	07-Oct	04-Nov	09-Dec
2005	13-Jan	10-Feb	10-Mar	07-Apr	09-May	09-Jun	07-Jul	04-Aug	08-Sep	06-Oct	10-Nov	08-Dec
2006	12-Jan	09-Feb	09-Mar	06-Apr	04-May	08-Jun	06-Jul	03-Aug	07-Sep	05-Oct	09-Nov	07-Dec
2007	11-Jan	08-Feb	08-Mar	05-Apr	10-May	07-Jun	05-Jul	02-Aug	06-Sep	04-Oct	08-Nov	06-Dec
2008	10-Jan	07-Feb	06-Mar	10-Apr	08-May	05-Jun	10-Jul	07-Aug	04-Sep	08-Oct	06-Nov	04-Dec
2009	08-Jan	05-Feb	05-Mar	09-Apr	07-May	04-Jun	09-Jul	06-Aug	10-Sep	08-Oct	05-Nov	10-Dec
2010	07-Jan	04-Feb	04-Mar	08-Apr	10-May	10-Jun	08-Jul	05-Aug	09-Sep	07-Oct	04-Nov	09-Dec
2011	13-Jan	10-Feb	10-Mar	07-Apr	05-May	09-Jun	07-Jul	04-Aug	08-Sep	06-Oct	10-Nov	08-Dec
2012	12-Jan	09-Feb	08-Mar	05-Apr	10-May	07-Jun	05-Jul	02-Aug	06-Sep	04-Oct	08-Nov	06-Dec
2013	10-Jan	07-Feb	07-Mar	04-Apr	09-May	06-Jun	04-Jul	01-Aug	05-Sep	10-Oct	07-Nov	05-Dec
2014	09-Jan	06-Feb	06-Mar	10-Apr	08-May	05-Jun	10-Jul	07-Aug	04-Sep	09-Oct	06-Nov	04-Dec
2015	08-Jan	05-Feb	05-Mar	09-Apr	11-May	04-Jun	09-Jul	06-Aug	10-Sep	08-Oct	05-Nov	10-Dec
2016	14-Jan	04-Feb	17-Mar	14-Apr	12-May	16-Jun	14-Jul	04-Aug	15-Sep	.	03-Nov	15-Dec
2017	.	02-Feb	16-Mar	.	11-May	15-Jun	.	03-Aug	14-Sep	.	02-Nov	14-Dec
2018	.	08-Feb	22-Mar	.	10-May	21-Jun	.	02-Aug	13-Sep	.	01-Nov	20-Dec
2019	.	07-Feb	21-Mar	.	02-May	20-Jun	.	01-Aug	19-Sep	.	07-Nov	19-Dec
2020	30-Jan	.	26-Mar	.	07-May	18-Jun	.	06-Aug	17-Sep	.	05-Nov	17-Dec
2021	.	04-Feb	18-Mar	.	06-May	24-Jun	-	-	-	-	-	-

Note: the table shows the dates of scheduled MPC meetings from May 1997 to June 2021. These dates represents the days when monetary policy actions or non-actions after scheduled meetings became known to the public.

Table 10: Yield Changes before MPC Meetings: Adding Unscheduled MPC Meetings

	$\Delta 5y$ yield	$\Delta 10y$ yield	$\Delta 15y$ yield	$\Delta 20y$ yield
	(1)	(2)	(3)	(4)
(A) Yield Changes before MPC Meetings				
pre-MPC window	0.32	0.51**	0.56***	0.57***
	(1.62)	(2.43)	(2.72)	(2.76)
Constant	-0.14**	-0.16**	-0.16**	-0.16***
	(-2.25)	(-2.39)	(-2.56)	(-2.62)
N	6128	6128	6128	6128
(B) Yield Changes before MPC Meetings and during Bond Issuance				
Pre-MPC window # Issuance	0.28	0.66**	0.76***	0.77***
	(1.05)	(2.23)	(2.61)	(2.67)
Pre-MPC window # No issuance	0.44	0.40	0.37	0.37
	(1.56)	(1.39)	(1.36)	(1.33)
Outside MPC window # Issuance	0.22	0.19	0.18	0.16
	(1.26)	(1.03)	(1.00)	(0.94)
Constant	-0.17**	-0.18***	-0.18***	-0.18***
	(-2.54)	(-2.62)	(-2.76)	(-2.79)
N	6128	6128	6128	6128
(C) Yield Changes before MPC Meetings and during Large Bond Issuance				
Pre-MPC window # Large issuance	0.42	0.87**	1.01***	1.06***
	(1.10)	(2.16)	(2.60)	(2.73)
Pre-MPC window # No Large issuance	0.30	0.39	0.39*	0.38
	(1.31)	(1.60)	(1.65)	(1.60)
Outside MPC window # Large issuance	0.10	-0.09	-0.21	-0.29
	(0.44)	(-0.36)	(-0.90)	(-1.26)
Constant	-0.15**	-0.15**	-0.14**	-0.14**
	(-2.27)	(-2.21)	(-2.23)	(-2.20)
N	6128	6128	6128	6128

Note: Panel A of this table regresses daily changes in the 5-year, 10-year, 15-year and 20-year yields on UK nominal government bonds on an indicator variable that takes value one for days that are either one or two days before MPC days. Panel B regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new (nominal or inflation-linked) bond issuance, (ii) pre-MPC windows without new bond issuance and (iii) all trading days with issuance and without MPC meetings. Panel C regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new (nominal or inflation-linked) large bond issuance (i.e. issuance larger than the median issuance in the given year), (ii) pre-MPC windows without new large bond issuance and (iii) all trading days with large issuances and without MPC meetings. All regressions include a constant. The estimation period covers 1997m5-2021m7 and 273 MPC announcement windows (270 scheduled and 3 unscheduled announcements).

Table 11: Yield Changes before MPC Meetings: Adding Lags

(A) Yield Changes before MPC Meetings				
	$\Delta 5y$ yield	$\Delta 10y$ yield	$\Delta 15y$ yield	$\Delta 20y$ yield
	(1)	(2)	(3)	(4)
pre-MPC window	0.28	0.43**	0.47**	0.47**
	(1.39)	(2.10)	(2.37)	(2.39)
First lag of yield changes	0.04**	0.03*	0.05**	0.07***
	(2.37)	(1.74)	(2.35)	(2.95)
Second lag of yield changes	-0.01	-0.03*	-0.04**	-0.05**
	(-0.62)	(-1.91)	(-2.29)	(-2.47)
N	6126	6126	6126	6126
(B) Yield Changes before MPC Meetings and during Bond Issuance				
Pre-MPC window # Issuance	0.19	0.52*	0.62**	0.64**
	(0.70)	(1.84)	(2.27)	(2.38)
Pre-MPC window # No issuance	0.45	0.39	0.34	0.31
	(1.59)	(1.36)	(1.24)	(1.12)
Outside MPC window # Issuance	0.22	0.19	0.17	0.13
	(1.27)	(1.04)	(0.95)	(0.79)
First lag of yield changes	0.04**	0.03*	0.05**	0.07***
	(2.36)	(1.73)	(2.33)	(2.93)
Second lag of yield changes	-0.01	-0.03*	-0.04**	-0.05**
	(-0.63)	(-1.92)	(-2.30)	(-2.48)
N	6126	6126	6126	6126
(C) Yield Changes before MPC Meetings and during Large Bond Issuance				
Pre-MPC window # Large issuance	0.41	0.84**	0.97**	1.00***
	(1.05)	(2.09)	(2.49)	(2.59)
Pre-MPC window # No Large issuance	0.24	0.29	0.28	0.26
	(1.06)	(1.23)	(1.25)	(1.18)
Outside MPC window # Large issuance	0.09	-0.10	-0.23	-0.31
	(0.40)	(-0.39)	(-0.96)	(-1.38)
First lag of yield changes	0.04**	0.03*	0.05**	0.07***
	(2.37)	(1.74)	(2.34)	(2.96)
Second lag of yield changes	-0.01	-0.03*	-0.04**	-0.05**
	(-0.63)	(-1.92)	(-2.29)	(-2.47)
N	6126	6126	6126	6126

Note: Panel A of this table regresses daily changes in the 5-year, 10-year, 15-year and 20-year yields on UK nominal government bonds on an indicator variable that takes value one for days that are either one or two days before MPC days. Panel B regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new (nominal or inflation-linked) bond issuance, (ii) pre-MPC windows without new bond issuance and (iii) all trading days with issuance and without MPC meetings. Panel C regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new large (nominal or inflation-linked) bond issuance (i.e. issuance larger than the median issuance in the given year), (ii) pre-MPC windows without new large bond issuance and (iii) all trading days with large issuances and without MPC meetings. All regressions include a constant. The estimation period covers 1997m5-2021m7 and 270 MPC announcement windows.

Table 12: Daily Yield Changes around MPC Meetings

(a) All MPC Meetings

	$\Delta_{t-4,t-3}$	$\Delta_{t-3,t-2}$	$\Delta_{t-2,t-1}$	$\Delta_{t-1,t}$	$\Delta_{t,t+1}$	$\Delta_{t+,1t+2}$
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: pre-MPC window						
Pre-MPC	-0.24	0.50*	0.58**	0.18	-0.27	0.28
	(-0.93)	(1.77)	(2.04)	(0.53)	(-0.70)	(1.02)
Panel B: pre-MPC and Issuance						
Pre-MPC # Bond issuance	-0.11	0.62	0.83**	0.14	-0.60	0.52
	(-0.33)	(1.54)	(2.05)	(0.30)	(-1.06)	(1.41)
Pre-MPC # No Bond issuance	-0.40	0.36	0.28	0.23	0.15	-0.02
	(-1.01)	(0.93)	(0.72)	(0.48)	(0.31)	(-0.06)
Panel C: pre-MPC and Large Issuance						
Pre-MPC # Large bond issuance	-0.38	1.05**	1.06*	0.23	-0.28	0.51
	(-0.96)	(1.98)	(1.89)	(0.29)	(-0.31)	(0.94)
Pre-MPC # No Large bond issuance	-0.20	0.32	0.42	0.16	-0.26	0.20
	(-0.63)	(0.98)	(1.30)	(0.45)	(-0.65)	(0.65)

(b) Scheduled MPC Meetings

	$\Delta_{t-4,t-3}$	$\Delta_{t-3,t-2}$	$\Delta_{t-2,t-1}$	$\Delta_{t-1,t}$	$\Delta_{t,t+1}$	$\Delta_{t+,1t+2}$
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: pre-MPC window						
Pre-MPC	-0.22	0.54*	0.43*	0.12	-0.12	0.27
	(-0.90)	(1.91)	(1.65)	(0.35)	(-0.35)	(1.04)
Panel B: pre-MPC and Issuance						
Pre-MPC # Bond issuance	-0.04	0.67*	0.59*	0.05	-0.33	0.51
	(-0.13)	(1.71)	(1.68)	(0.11)	(-0.65)	(1.50)
Pre-MPC # No Bond issuance	-0.45	0.37	0.25	0.19	0.13	-0.02
	(-1.12)	(0.97)	(0.64)	(0.41)	(0.27)	(-0.05)
Panel C: pre-MPC and Large Issuance						
Pre-MPC # Large bond issuance	-0.38	1.05**	1.05*	0.23	-0.27	0.51
	(-0.95)	(1.98)	(1.88)	(0.29)	(-0.30)	(0.94)
Pre-MPC # No Large bond issuance	-0.17	0.37	0.23	0.08	-0.07	0.19
	(-0.58)	(1.13)	(0.79)	(0.22)	(-0.21)	(0.65)

Note: This table shows average daily changes in the 20-year yield on UK nominal government bonds on days around MPC meetings (subpanel A), around MPC meetings with issuances one or two days before the meeting (subpanel B) and around MPC meetings with large issuances one or two days before the meeting. Panel A uses all MPC meetings and Panel B uses only scheduled MPC meetings. All regressions include a constant (not shown). The estimation period covers 1997m5-2021m7. The t-statistics are based on robust standard errors.

Table 13: Yield Changes before MPC Meetings: Expansionary vs Contractionary Monetary Policy Shocks

	$\Delta 5y$ yield	$\Delta 10y$ yield	$\Delta 15y$ yield	$\Delta 20y$ yield
	(1)	(2)	(3)	(4)
MP Shock = Contractionary	0.04	-0.08	-0.09	-0.12
	(0.11)	(-0.18)	(-0.23)	(-0.30)
N	516	516	516	516

Note: this table regresses daily changes in the 5-year, 10-year, 15-year and 20-year yields on UK nominal government bonds during pre-MPC windows on an indicator variable that takes value one if the impending monetary policy surprise turns out to the contractionary and zero otherwise. The identification of the monetary policy surprise follows Cesa-Bianchi, Thwaites, and Vicondoa (2020) (which, in turn, builds on Miranda-Agrippino (2016), Gerko and Rey (2017) and related papers) and looks at movements in the price of 3-month Sterling futures contracts in a 30-minute window around the interest rate announcement of the Bank of England. An increase (decrease) in the price is regarded as a monetary policy expansion (contraction). We have 258 pre-MPC windows and 516 trading days for the period spanning June 1997 to December 2019. All regressions include a constant. The estimation period covers 1997m5-2019m12 and 258 MPC announcement windows.

Table 14: Average Issuance during Weeks with and without Scheduled MPC meetings

		(1)	(2)	(3)
Time period		Nominal	Linker	All Bonds
1997-2021	Change in MPC weeks	226.67	-130.60**	96.07
	Weeks without MPC	1694.62***	319.34***	2013.95***
1997-2004	Change in MPC weeks	-239.50*	-10.75	-250.25*
	Weeks without MPC	377.00***	49.50***	426.50***
2005-2012	Change in MPC weeks	471.67	-327.38***	144.28
	Weeks without MPC	1916.14***	457.73***	2373.87***
2013-2021	Change in MPC weeks	486.11	15.24	501.34
	Weeks without MPC	2665.55***	434.21***	3099.76***

Note: the table reports average issuances of nominal bonds (column 1), inflation-linked bonds (column 2) and all bonds (column 3) on weeks without scheduled MPC meetings as well as the difference in issuances on weeks with scheduled MPC meetings. The values are in $millions, and the stars indicate whether the values are statistically different from zero (using robust standard errors) at 1%, 5 and 10% significance levels. The whole sample includes 1270 weeks, and the subsamples 1997-2004, 2005-2012 and 2013-2021 include 403, 418 and 449 weeks, respectively.

Table 15: Distribution of Trading Days in the US

	Non-Issuance Days	Issuance Days	Total
Non-FOMC Days	7,243	2,305	9,548
FOMC Days	271	118	389
Total	7,514	2,423	9,937

Notes: The sample covers 1980m1-2019m10. Issuance days refer to days on which the US Treasury issues notes and bonds with maturity more than four years.

Table 16: Real Yield Changes before MPC Meetings

(A) Real Yield Changes before MPC Meetings				
	$\Delta 5y$ yield	$\Delta 10y$ yield	$\Delta 15y$ yield	$\Delta 20y$ yield
	(1)	(2)	(3)	(4)
pre-MPC window	0.04	0.16	0.17	0.14
	(0.20)	(0.94)	(1.03)	(0.89)
Constant	-0.11*	-0.12**	-0.12**	-0.11**
	(-1.82)	(-2.18)	(-2.35)	(-2.37)
N	6128	6128	6128	6128
(B) Real Yield Changes before MPC Meetings and during Bond Issuance				
Pre-MPC window # Issuance	0.21	0.40	0.42*	0.40*
	(0.72)	(1.50)	(1.74)	(1.70)
Pre-MPC window # No issuance	-0.15	-0.07	-0.09	-0.13
	(-0.72)	(-0.36)	(-0.49)	(-0.70)
Outside MPC window # Issuance	0.07	0.16	0.18	0.16
	(0.38)	(0.93)	(1.18)	(1.07)
Constant	-0.12*	-0.14**	-0.14***	-0.14***
	(-1.86)	(-2.45)	(-2.71)	(-2.70)
N	6128	6128	6128	6128
(C) Real Yield Changes before MPC Meetings and during Large Bond Issuance				
Pre-MPC window # Large issuance	0.72	0.88**	0.82**	0.77**
	(1.57)	(2.13)	(2.19)	(2.16)
Pre-MPC window # No Large issuance	-0.17	-0.06	-0.05	-0.07
	(-0.85)	(-0.34)	(-0.27)	(-0.43)
Outside MPC window # Large issuance	0.21	0.13	0.07	-0.01
	(0.83)	(0.59)	(0.32)	(-0.05)
Constant	-0.13**	-0.13**	-0.12**	-0.11**
	(-1.99)	(-2.27)	(-2.36)	(-2.29)
N	6128	6128	6128	6128

Note: Panel A of this table regresses daily changes in the 5-year, 10-year, 15-year and 20-year yields on inflation-linked government bonds on an indicator variable that takes value one for days that are either one or two days before MPC days. Panel B regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new (nominal or inflation-linked) bond issuance, (ii) pre-MPC windows without new bond issuance and (iii) all trading days with issuance and without MPC meetings. Panel C regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new large (nominal or inflation-linked) bond issuance (i.e. issuance larger than the median issuance in the given year), (ii) pre-MPC windows without new large bond issuance and (iii) all trading days with large issuances and without MPC meetings. All regressions include a constant. The estimation period covers 1997m5-2021m7 and 270 MPC announcement windows.

Table 17: Real Yield Changes before MPC Meetings: Around Nominal Bond Issuance

(A) Real Yield Changes before MPC Meetings and during Bond Issuance				
Pre-MPC window # Issuance	0.01	0.22	0.26	0.27
	(0.04)	(0.73)	(0.94)	(0.97)
Pre-MPC window # No issuance	0.02	0.12	0.11	0.05
	(0.09)	(0.61)	(0.58)	(0.31)
Outside MPC window # Issuance	-0.21	-0.00	0.06	0.04
	(-0.90)	(-0.01)	(0.31)	(0.20)
Constant	-0.09	-0.12**	-0.12**	-0.12**
	(-1.43)	(-2.10)	(-2.36)	(-2.35)
N	6128	6128	6128	6128
(C) Real Yield Changes before MPC Meetings and during Large Bond Issuance				
Pre-MPC window # Large issuance	0.71*	0.97**	0.89**	0.81**
	(1.72)	(2.37)	(2.20)	(1.99)
Pre-MPC window # No Large issuance	-0.11	-0.02	-0.01	-0.03
	(-0.54)	(-0.13)	(-0.03)	(-0.16)
Outside MPC window # Large issuance	0.03	-0.03	-0.12	-0.24
	(0.09)	(-0.10)	(-0.51)	(-1.03)
Constant	-0.11*	-0.12**	-0.11**	-0.10**
	(-1.80)	(-2.11)	(-2.18)	(-2.09)
N	6128	6128	6128	6128

Note: Panel A regresses daily changes in real yields on indicators variables capturing (i) pre-MPC windows with new nominal bond issuance, (ii) pre-MPC windows without new nominal bond issuance and (iii) all trading days with nominal issuance and without MPC meetings. Panel B regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new large nominal bond issuance (i.e. issuance larger than the median issuance in the given year), (ii) pre-MPC windows without new large nominal bond issuance and (iii) all trading days with large issuances and without MPC meetings. All regressions include a constant. The estimation period covers 1997m5-2021m7 and 270 MPC announcement windows.

Table 18: Real Yield Changes before MPC Meetings: Around Inflation-Linked Bond Issuance

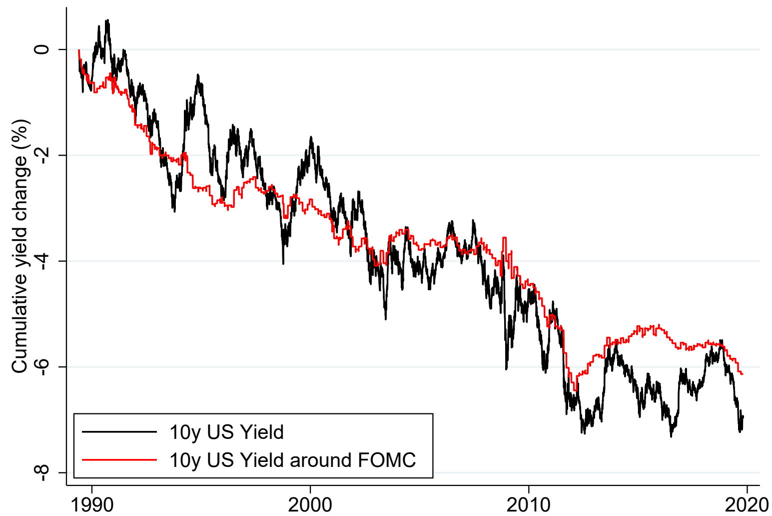
(A) Real Yield Changes before MPC Meetings and during Bond Issuance				
Pre-MPC window # Issuance	0.70	0.62	0.55	0.49
	(1.21)	(1.32)	(1.34)	(1.28)
Pre-MPC window # No issuance	-0.08	0.08	0.10	0.08
	(-0.42)	(0.46)	(0.59)	(0.48)
Outside MPC window # Issuance	0.52*	0.38	0.34	0.33
	(1.89)	(1.46)	(1.39)	(1.36)
Constant	-0.14**	-0.14**	-0.13***	-0.13***
	(-2.19)	(-2.48)	(-2.64)	(-2.68)
N	6128	6128	6128	6128
(C) Real Yield Changes before MPC Meetings and during Large Bond Issuance				
Pre-MPC window # Large issuance	0.66	0.58	0.64	0.70
	(0.54)	(0.59)	(0.79)	(1.03)
Pre-MPC window # No Large issuance	0.00	0.14	0.14	0.11
	(0.02)	(0.83)	(0.88)	(0.67)
Outside MPC window # Large issuance	0.52	0.41	0.41	0.41
	(1.27)	(1.06)	(1.12)	(1.17)
Constant	-0.12**	-0.13**	-0.13**	-0.12**
	(-2.00)	(-2.34)	(-2.52)	(-2.56)
N	6128	6128	6128	6128

Note: Panel A regresses daily changes in real yields on indicators variables capturing (i) pre-MPC windows with new inflation-linked bond issuance, (ii) pre-MPC windows without new inflation-linked bond issuance and (iii) all trading days with inflation-linked issuance and without MPC meetings. Panel B regresses daily changes in yields on indicators variables capturing (i) pre-MPC windows with new large inflation-linked bond issuance (i.e. issuance larger than the median issuance in the given year), (ii) pre-MPC windows without new large inflation-linked bond issuance and (iii) all trading days with large issuances and without MPC meetings. All regressions include a constant. The estimation period covers 1997m5-2021m7 and 270 MPC announcement windows.

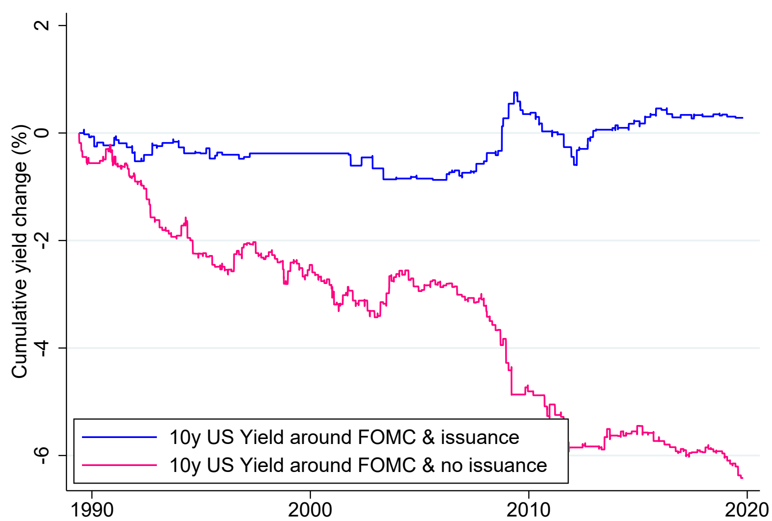
A.2 Figures

Figure 8: A Decomposition of Long-term US Yields: 1980m1-2019m10

(a) Specification of Hillenbrand (2020)



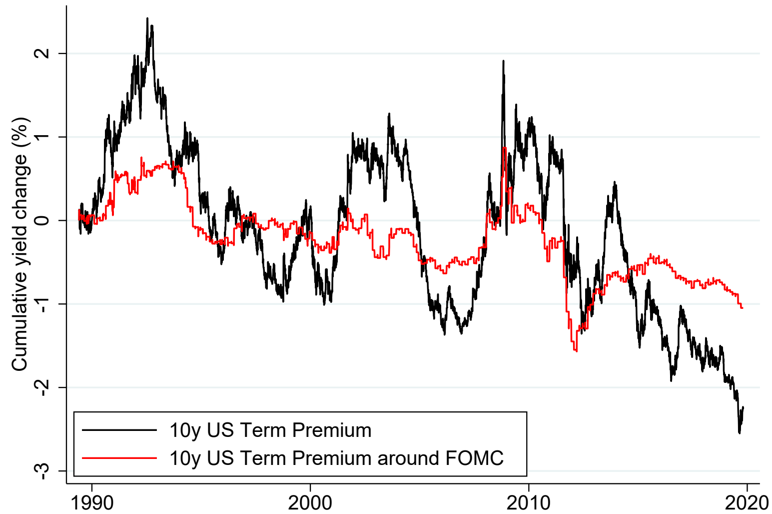
(b) The FOMC-drift with and without New Bond Issuance



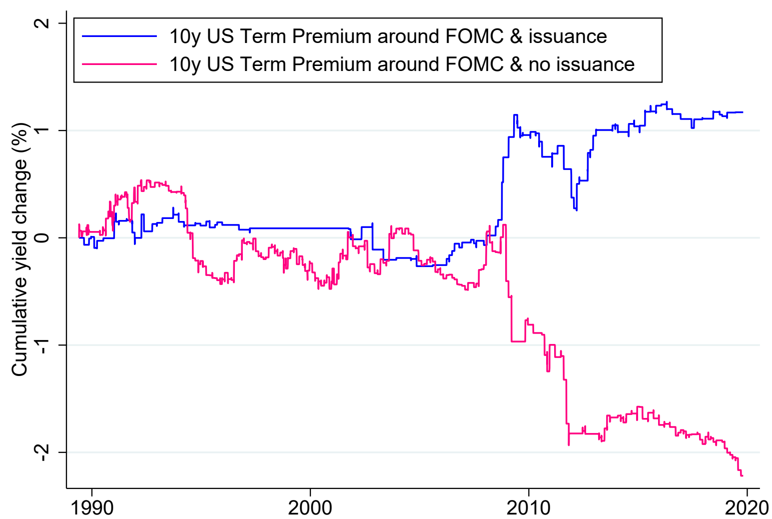
Note: Panel A of this figure is constructed following Hillenbrand (2020) and documents that the 3-day window around FOMC meetings captures the secular decline of the 10-year U.S. Treasury yield. This 3-day window includes for every FOMC meeting the day prior to the meeting, the day of the meeting and the day after the meeting. The black line shows the actual evolution of the 10-year U.S. Treasury yield. The red line in Panel A shows a hypothetical time series that is constructed by taking into account only the yield changes that were realized in the 3-day window around FOMC meetings; the yield changes that occurred on all days outside of this window are set to zero. Panel B decomposes the red line in Panel A by distinguish between FOMC meeting windows with and without new issuances of US Treasuries (with more than four years of maturity). Out of the 268 FOMC meeting windows in the sample, 88 of them coincide with issuances, and the remaining 180 FOMC windows have no concurrent issuance of such Treasuries. The blue (magenta) line shows the hypothetical time series based on FOMC windows with (without) new bond issuances. The analysis includes all FOMC meetings from June 1989 to Oct 2019.

Figure 9: A Decomposition of Long-term US Term Premium: 1980m1-2019m10

(a) Specification of Hillenbrand (2020)



(b) The FOMC-drift with and without New Bond Issuance



Note: Panel A of this figure is constructed following Hillenbrand (2020) and shows the realised and counterfactual time-series of the 10-year US term premium, obtained from the Federal Reserve Bank of New York website. The counterfactual time-series (red line) are based on changes in the premium during the 3-day FOMC window: the day prior to the meeting, the day of the meeting and the day after the meeting. The black line shows the actual evolution of the estimated term premium. Panel B decomposes the red line in Panel A by distinguish between FOMC meeting windows with and without new issuances of US Treasuries (with more than four years of maturity). Out of the 268 FOMC meeting windows in the sample, 88 of them coincide with issuances, and the remaining 180 FOMC windows have no concurrent issuance of such Treasuries. The blue (magenta) line shows the hypothetical time series based on FOMC windows with (without) new bond issuances. The analysis includes all FOMC meetings from June 1989 to Oct 2019.

A.3 Description of the Term Structure Model

A.3.1 Excess Returns

This section summarises the dynamic no-arbitrage affine term structure model, based on Adrian, Crump, and Moench (2013) and Malik and Meldrum (2016), that we use to decompose long-term bond yields into expectations of future short-term interest rates and the term premia that compensate investors for the risk associated with holding long-term bonds. The dynamics of a $K \times 1$ of state variables evolve according to a Gaussian vector autoregression (VAR(1)):

$$X_{t+1} = \mu + \Phi X_t + v_{t+1}, \tag{A.1}$$

where the shocks $v_{t+1} \sim N(0, \Sigma)$ are conditionally Gaussian, homoscedastic and independent across time. The price of a zero coupon bond with maturity n at time t is denoted by $P_t^{(n)}$. The assumption of no-arbitrage implies the existence of a pricing kernel M_{t+1} such that:

$$P_t^{(n)} = \mathbb{E}\left[M_{t+1}, P_{t+1}^{(n-1)}\right]. \tag{A.2}$$

The pricing kernel is assumed to be exponentially affine:

$$M_{t+1} = \exp\left(-r_t - \frac{1}{2}\lambda_t'\lambda_t - \lambda_t'\Sigma^{-1/2}v_{t+1}\right), \tag{A.3}$$

where $r_t = \ln P_t^{(1)}$ is the continuously compounded risk-free interest rate. Further, market prices of risk are assumed to be affine in the state variables (Duffee, 2002):

$$\lambda_t = \Sigma^{-1/2}\left(\lambda_0 + \lambda_1 X_t\right). \tag{A.4}$$

The natural logarithm of excess one-period holding return of a bond maturing in n periods is written as:

$$rx_{t+1}^{(n-1)} = \ln P_{t+1}^{(n-1)} - \ln P_t^{(n)} - r_t. \tag{A.5}$$

Combining A.2, A.3 and A.5 yields:

$$1 = \mathbb{E}_t\left[\exp\left(rx_{t+1}^{(n-1)} - \frac{1}{2}\lambda_t'\lambda_t - \lambda_t'\Sigma^{-1/2}v_{t+1}\right)\right]. \tag{A.6}$$

Assuming that $\left\{rx_{t+1}^{(n-1)}, v_{t+1}\right\}$ are jointly normally distributed, we can write:

$$\mathbb{E}_t\left[rx_{t+1}^{(n-1)}\right] = Cov_t\left[rx_{t+1}^{(n-1)}, v_{t+1}'\Sigma^{-1/2}\lambda_t\right] - \frac{1}{2}Var_t\left[rx_{t+1}^{(n-1)}\right]. \tag{A.7}$$

Denoting $\beta_t^{(n-1)} = Cov_t\left[rx_{t+1}^{(n-1)}, v_{t+1}'\right]\Sigma^{-1}$ and using A.4, A.7 can be written as:

$$\mathbb{E}_t\left[rx_{t+1}^{(n-1)}\right] = \beta_t^{(n-1)\prime}\left(\lambda_0 + \lambda_1 X_t\right) - \frac{1}{2}Var_t\left[rx_{t+1}^{(n-1)}\right].$$

One can then decompose unexpected excess returns into a components that is correlated with v_{t+1} and another component that is conditionally orthogonal:

$$rx_{t+1}^{(n-1)} - \mathbb{E}_t\left[rx_{t+1}^{(n-1)}\right] = \beta_t^{(n-1)\prime} v_{t+1} + e_{t+1}^{(n-1)}, \tag{A.8}$$

where $e_{t+1}^{(n-1)} \sim N\left(0, \sigma^2\right)$. The return generating process for log excess holding period returns is then written as:

$$\begin{aligned} rx_{t+1}^{(n-1)} =& \beta_t^{(n-1)\prime}\left(\lambda_0 + \lambda_1 X_t\right) - \frac{1}{2}\beta_t^{(n-1)\prime}\Sigma\beta_t^{(n-1)} + \sigma^2 \\ &+ \beta_t^{(n-1)\prime} v_{t+1} + e_{t+1}^{(n-1)}. \end{aligned} \tag{A.9}$$

Stacking this system across maturities and time periods, excess returns can be rewritten as:

$$rx = \boldsymbol{\beta}'\left(\lambda_0 \iota_T' + \lambda_1 X_-\right) - \frac{1}{2}\left(B^\star vec\left(\Sigma\right) + \sigma^2 \iota_N\right)\iota_T' + \boldsymbol{\beta}' V + E, \tag{A.10}$$

where rx is an $N \times T$ matrix of excess return, $\boldsymbol{\beta} = \left[\beta^{(1)}\ \beta^{(2)}\ \ldots \beta^{(N)}\right]$ is a $K \times N$ matrix of factor loadings, ι_T and ι_N are a $T \times 1$ and $N \times 1$ vectors of ones, $X_- = \left[X_0\ X_1\ \ldots X_{T-1}\right]$ is a $K \times T$ matrix of lagged pricing factors, $B^\star = \left[vec\left(\beta^{(1)}\beta^{(1)\prime}\right)\ldots vec\left(\beta^{(N)}\beta^{(N)\prime}\right)\right]$ is an $N \times K^2$ matrix, and V and E are matrices of $K \times T$ and $N \times T$ dimensions.

A.3.2 Estimation

Given A.10, the three-step regression-based estimator for the parameters of the model is summarised as follows:

1. Estimate A.1 with ordinary least squares, and use the residuals, $\hat{V}$, to estimate the variance-covariance matrix of the state variables, $\hat{\Sigma} = \hat{V}\hat{V}'/T$.

2. Regress excess returns on a constant, lagged pricing factors and contemporaneous pricing factor innovations, $rx = a\iota_T' + \beta'\hat{V} + cX_- + E$, yielding estimates $\hat{a}$, $\hat{\beta}$ and $\hat{c}$ as well as $\hat{\sigma}^2 = tr\left(\hat{E}\hat{E}'\right)/NT$.

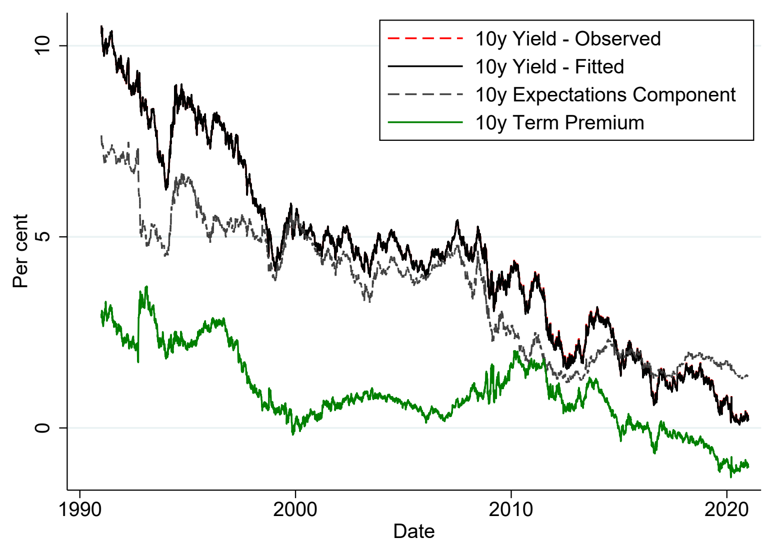
3. Using $\hat{B}^\star$ constructed from $\hat{\beta}$ and noting that $a = \beta'\lambda_0 - \frac{1}{2}\left(B^\star vec\left(\Sigma\right) + \sigma^2\iota_N\right)$ and $c = \beta'\lambda_1$,we can estimate the parameters of the price or risk using cross-sectional regressions:

$$\begin{aligned} \hat{\lambda}_0 &= \left(\hat{\beta}\hat{\beta}'\right)^{-1}\hat{\beta}\left(\hat{a} + \frac{1}{2}\left(\hat{B}^\star vec\left(\hat{\Sigma}\right) + \hat{\sigma}^2\iota_N\right)\right) \\ \hat{\lambda}_1 &= \left(\hat{\beta}\hat{\beta}'\right)^{-1}\hat{\beta}\hat{c}. \end{aligned} \tag{A.11}$$

A.3.3 Implementation

We use as factors the first five principal components of the yield curve. We estimate the factor loadings at monthly frequency, and combine these estimates with the daily time-series of the factors to obtain daily estimates term premia and expectations components. We thereby follow section 4.4 of Adrian, Crump, and Moench (2013). The estimation sample covers Jan 1991 – Dec 2020, including 7584 daily observations.

Figure 10: Decomposition of the 10-year UK Nominal Government Bond Yield



Note: The Figure shows the decomposition of the UK 10-year yields into expectation (gray dashed line) and term premium (solid green line) components, implied by the term structure model of Adrian, Crump, and Moench (2013) and Malik and Meldrum (2016) over the sample 1991m1-2020m12; the black solid (red dash) line depicts the realised (fitted) yields.

Figure 10 shows the decomposition of the UK 10-year yields into expectation (gray dashed line) and term premium (solid green line) components; the black solid (red dash) line depicts the realised (fitted) yields. The obtained decomposition is similar to recent estimates of the UK term structure decompositions (Moench, 2019). Daily changes in the estimated expectation and term premium components of the 10-year yields are then used as left-hand side variables in our baseline regressions 3.1–3.2, with the results presented in Table 3.

A.4 Proof of Proposition 1

Let $q_t^i = D_t^i - D_{t-1}^i$ for $t \in \{1, 2\}$ and $i \in \{HF, D, UC\}$, where $D_0^{HF} = D_0^{UC} = 0$ and $D_0^D = z$. Then, q_1^{HF} follows from (5.10); q_1^D and q_1^{UC} follow from (5.12); and P_1 is a re-statement of (5.11). Turning to the equilibrium objects at $t = 2$, $q_2^{HF}(\tilde{v})$ follows from the equilibrium level of D_1^{HF} given by (5.10) and $D_2^{HF}\left(\tilde{v}, D_1^{HF}\right) \sim \mathcal{N}\left(\frac{D_1^{HF}}{2} + \frac{\tilde{v}-v+\bar{\gamma}z}{2(\bar{\gamma}+\lambda)}, b^2\right)$ evaluated at the equilibrium level of

D_1^{HF}; $q_2^D(\tilde{v})$ and $q_2^{UC}(\tilde{v})$ follow from (5.7), (5.10), and (5.12); and finally $P_2(\tilde{v})$ follows from (5.6) and (5.10).